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	Qinghai Maqin Gequ Level 2 hydropower Station
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	4.1
Completion date of the PDD	09/06/2021
Project participants	Qinghai Maqin Gequ River Cascade Hydropower Development Co., LTD（Project Owner） Carbon & Energy Capital Co. LTD（Buyer） Carbon 350 Ltd.（Buyer） Climate Wedge Ltd Oy （Buyer）
Host Party	People's Republic of China
Applied methodologies and standardized baselines	Methodology: ACM0002 "Grid-connected electricity generation from renewable sources" (version 20.0) Standardized baselines: N/A
Sectoral scopes	Sectoral Scope 1: Energy Industries (renewable/non-renewable sources)
Estimated amount of annual average GHG emission reductions	123,721tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The objective of Qinghai Maqin Gequ Level 2 hydropower station (hereinafter referred to as the "Project") is to generate zero-green gas emission electricity through the application of a renewable source (in this case, it is hydropower) and displace the same amount of electricity from the Northwest China Power Grid (NWPG) that is mainly dominated by electricity derived from coal-fired power plants. The Project, which is located in the Maqin County, Guoluo Zang Autonomous Prefecture, Qinghai Province, P.R. China, is supposed to meet the increasing demand of electricity in Qinghai Province in a sustainable way and contribute to the sustainability of the NWPG. The Project is constructed and operated by Qinghai Maqin Gequ River Cascade Hydropower Development Co., LTD.

The main components of the Project include the diversion system, factory buildings and substation. The existing scenario prior to the start of the implementation of the Project is: electricity delivered to the grid by the existing coal-fired power plants connected to the Northwest China Power Grid (NWPG). The baseline scenario as identified in section B.4 is the same as this scenario.

The Project has installed 2 turbine-generator sets each with a unit capacity of 24MW for a total installed capacity of the hydropower station of 48MW. The Project is estimated to generate annually 250,870MWh of electricity and operate 5,226 hours annually with plant load factor of 59.7%[1], of which 223,525MWh is delivered to Qinghai provincial gird which is connected to NWPG. The estimated annual greenhouse gases (GHG) emission reduction of 123,721tCO_2e and a total of 866,047tCO_2e of GHG emission reductions during its second 7-year crediting period.

The project was registered as a CDM project on 03/10/2012 (UNFCCC registration No. 7507). The 1st 7-yr renewable crediting period was from 01/01/2014-31/12/2020; This PDD is renewal of the second crediting period, which starts from 01/01/2021-31/12/2027. From 01/01/2014-30/09/2015, the total CERs of 276,440tCO_2e has been issued.

Relevant dates for the project activity are listed as below:

Starting date of construction	20/04/2011
The date on which the first hydro turbine started operation	10/06/2014
The date on which all the hydro turbines started operation	21/06/2014

The Project contribute to the sustainable development of the local area and the Host Country by enhancing the electricity supply capacity and improving the electricity quality and reducing transmission line loss for the area as well as by bringing positive social and environmental benefits to local communities. The specific sustainable development benefits of the Project are listed as follows:

- Reducing the reliance of the NWPG on exhaustible fossil fuels for power generation;
- Reducing air pollution by fossil fuel based electricity by clean, renewable power ;
- Improving the power mix of the NWPG by supplying clean energy;
- Improving the local energy generation infrastructure, bridging the gap between power supply and demand by increasing the electricity generation capacity to the local grid;
- Reducing the threat posed by air pollution to human health;

[1] The annual operation hours of the Project is 5,226 hours which is determined by the design institute (Qinghai Province Water Conservancy and Hydropower Survey Design Institute) based on 48 years historical hydraulic data. And the hours number in a whole year is 365*24=8,760. Therefore PLF of the Project is calculated as 5,226/8,760*100%=59.7%

- Creating job opportunities for the local communities. The Project provided 27 job opportunities throughout the operating period, and these employment opportunities are helpful for the local people to improve their living standards.

In views mentioned above, the Project strongly contributes to the sustainable development in local area.

A.2. Location of project activity

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The Project is located in Maqin County, Guoluo Zang Autonomous Prefecture of Qinghai Province, P.R.China. The straight-line distance from the location of the factory to Dawu town and Xining city, the provincial capital of Qinghai are respectively 53km and 493km. The geographical coordinate of the dam is 100°15′06″E, 34°46′50″N. And the geographical coordinate of the plant is 100°13′32"E, 34°50′35"N .The location of the Project is indicated in the maps below:

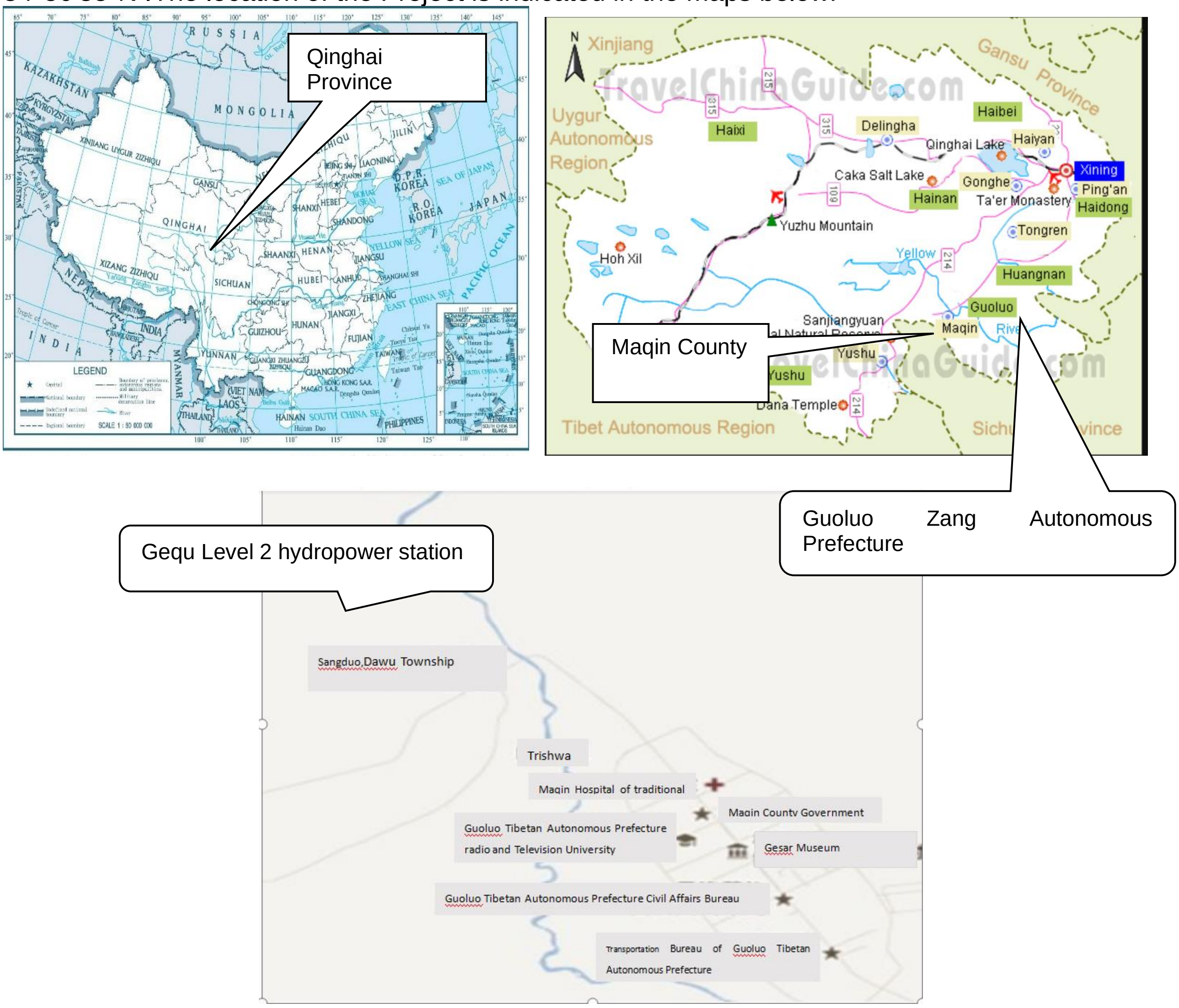

Figure A.2-1: Location of the Project

A.3. Technologies/measures

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The Project aims to generate electricity from hydropower resources and to displace the same amount of electricity from the Northwest China Power Grid (NWPG) whose generation mix is dominated by coal-fired, electricity generating power plants.

The existing scenario prior to the start of the implementation of the Project is: electricity delivered to the grid by the operation of grid connected thermal plants belonging to the Northwest China Power Grid (NWPG). The NWPG consists of 5 sub-grids: Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang provincial grids, which mainly rely on coal-fired power plants[2].The baseline scenario as identified in section B.4 of this PDD is the same as the existing scenario prior to the start of the implementation of the Project.

The Project is hydropower station with a total installed capacity of 48MW. The Project is estimated to generate annually 250,870MWh of electricity, of which 223,525MWh will be delivered to the power grid. The main manufacturing technology is to convert mechanical energy available in the water flow into electrical energy with the help of hydro turbines and generators. Main components of the Project include the dam on the river, diversion canal, factory buildings, booster station, transmission project and residential area. The Project is a daily regulation hydropower project. The normal water level of the Project is designed to be 3,412m. Under the normal water level, the reservoir capacity is designed to be 3,967,000m^3. The surface area of the reservoir is designed to be 245,900m^2. The power density of the Project is 195.2W/m^2 (see B.6.1 in PDD) and the power load factor of the project is 59.7%.

According to the technical agreement and templates of hydro turbine generators, the model of the hydro turbine used in the Project is CJA237-L-155/6*14 and the model of generator is SF24-12/3300.The key technical specifications of these two equipments are listed as Tables below:

Table A.3-1 Key technical specifications of Hydro turbines

Parameters Name	Unit	Data
Model	/	CJA237-L-155/6*14
Quantity	/	2
Rated Output	MW	24
Rated Rotation Speed	r/min	500
Rated head	m	376.7
Rated flow	m^3/s	7.96
Equipment life time	year	20
manufacture	/	Dongfeng Electric Machinery Co.,Ltd

Table A.3-2 Key technical specifications of Generators

Parameters Name	Unit	Data
Model	/	SF24-12/3300
Quantity	/	2
Installed capacity	MW	24
Rated Voltage	kV	10.5
Rated current	A	1649.6
Rated frequency	Hz	50
Rated Rotation Speed	r/min	500
Rated Power Factor	%	80
Equipment life time	year	20
manufacture	/	Dongfeng Electric Machinery Co.,Ltd

China possesses the technological capacity to manufacture all the necessary components, so no technology transfer is involved in the Project.

[2] http://www.mee.gov.cn/ywgz/ydqhbh/wsqtkz/202012/W020201229610353340851.pdf

The main meter M_2 (accuracy level >=0.5S) is a bidirectional power meter that installed at the Grid Company, which will monitor the quantity of net electricity generation supplied by the Project to the grid ($EG_{facility,y}$) ie. The electricity exported to the grid by the project subtracts the electricity imported to the project from the grid. M_2 owned and maintained by Qinghai Power Grid which belongs to NWPG. The backup meter M_1 installed at the project site and monitored the electricity coming out from the plant to grid and the electricity received by the plant from the grid, M_1 owned and maintained by the project owner. The difference between M_2 and M_1 is the line loss.

Detailed information regarding to monitoring system, please turn to section B.7.3.

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (host)	Qinghai Maqin Gequ River Cascade Hydropower Development Co., LTD	No
The United Kingdom of Great Britain and Northern Ireland	Carbon & Energy Capital Co. LTD	No
The United Kingdom of Great Britain and Northern Ireland	Carbon 350 Ltd.	No
Finland	Climate Wedge Ltd Oy	No

A.5. Public funding of project activity

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No public funding has been secured for this project.

A.6. History of project activity

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The project was registered as CDM project on 03/10/2012 (UNFCCC registration No. 7507). The PDD is renewal of crediting period. The Project is not a project activity that has been deregistered. The Project is not included as a component project activity (CPA) in a registered CDM programme of activities (PoA); The Project was not a CPA that has been excluded from a registered CDM PoA; The 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 CDM project activity.

A.7. Debundling

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Not Applicable.

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

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The approved large-scale consolidated methodology ACM0002: "Grid-connected electricity generation from renewable sources" (Version 20.0).
https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG

Tool to calculate the emission factor for an electricity system （Version 07.0）
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 03.0.1).
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf

Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0)
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf

More information on the methodology and tools listed above is available at the following website:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

B.2. Applicability of methodologies and standardized baselines

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The methodology ACM0002 (Version 20.0) is applicable to the Project, because the Project meets all the applicability criteria stated in the methodology with relevance to Hydropower power plant:

Clauses	Requirements of the ACM0002	Scenario of the project	conclusion
1	This methodology is applicable to grid connected renewable power generation project activities that: (a) Install a Greenfield power plant; (b) Involve a capacity addition to (an) existing plant(s); (c) Involve a retrofit of (an) existing operating plants/units; (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s)/unit(s).	The project is a greenfield grid connected renewable power generation project with no capacity addition involved.	Applicable
2	The methodology is applicable under the following conditions: (a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; (b) In the case of capacity additions, retrofits, rehabilitations, or replacements (except for wind, solar, wave or tidal power capacity addition projects) the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	The project activity involves the installation of a hydropower project. And the project is a newly built hydropower project, not involved in capacity additions, retrofits, rehabilitations or replacements the existing plant/unit.	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 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 $4W/m^2$; or (d) The project activity is an integrated hydropower project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using	The project is a greenfield grid connected renewable power generation project with no capacity addition involved, and the power density of power plant, as per definitions given in the project emissions section, is $195.2W/m^2$ which is greater than $4W/m^2$;	Applicable

	equation (7), is lower than or equal to 4 4W/m², all 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 4W/m²; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4W/m² shall be: a. Lower than or equal to 15 MW; and b. Less than 10 per cent of the total installed capacity of integrated hydro power project.		
4	In the case of integrated hydro power projects, project proponent shall: Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.	The project is a greenfield grid connected renewable power generation project, not integrated hydro power projects.	NA
5	The methodology is not applicable to: (a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; (b) Biomass fired power plants/units.	The project is a greenfield grid connected renewable power generation project with no fuel switch involved 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 hydro power project.	NA

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

Tool/Criteria	Applicability	Conclusion
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	The validity of the current baseline is assessed by the project using the following sub-steps: Step 1: Assess the validity of the current baseline for the next crediting period; Step 2: Update the current baseline and the data and parameters.	Applicable

period.		
Tool to calculate the emission factor for an electricity system/ This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	The Project is the installation of a hydro power plant supplying electricity to the Grid.	Applicable
Tool to calculate the emission factor for an electricity system/ In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The project electricity system is located in a non-Annex I country.	Applicable
Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation/ If emissions are calculated for electricity consumption, the tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption: (a) Scenario A: Electricity consumption from the grid. (b) Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). or (c) Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s).	The electricity consumption of the project is purchased from the grid.	Applicable
Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation/This tool can be referred to in methodologies to provide procedures to monitor amount of electricity generated in the project scenario, only if one out of the following three project scenarios applies to the recipient of the electricity generated: (a) Scenario I: Electricity is supplied to the grid; (b) Scenario II: Electricity is supplied to consumers/electricity consuming facilities; or (c) Scenario III: Electricity is supplied to the grid and consumers/electricity consuming facilities.	The electricity generated by the project is supplied to the grid.	Applicable
Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation/This tool is not applicable in cases where captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage. The tool only accounts for CO_2 emissions.	There are no captive renewable power generation technologies installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage.	Applicable

Therefore, the Project activity is in accordance with the applicability of ACM0002 (Version 20.0).

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

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According to the definition of project boundary by ACM0002, the project boundary includes the project power plant, and all power plants connected physically to the electricity system where the project is connected to. The electricity system is defined according to “Tool to calculate the emission factor for an electricity system” Version 7.0.

In this specific case, the hydro power plant is transferred to the Qinghai Grid which is connected to the NWPG. The NWPG consists of independent province-level electricity systems including Shaanxi Grid, Gansu Grid, Qinghai Grid, Ningxia Grid and Xinjiang Grid. According to the guidance given above, it is justifiable to identify the NWPG as the correct project boundary for this project.

Source		Gas	Included?	Justification / Explanation
Baseline	CO_2 emission from electricity generation in fossil fuel fired plants that are displaced due to the project activity.	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project Activity	For hydro power plants, emissions of CH_4 from the reservoir.	CO_2	No	Minor emission source.
		CH_4	No	The power density of the Project is 195W/m^2. According to ACM0002, if the power density is greater than 10W/m^2, there is no need to calculate emission from water reservoirs.
		N_2O	No	Minor emission source.

The project boundary is shown in the following flow diagram:

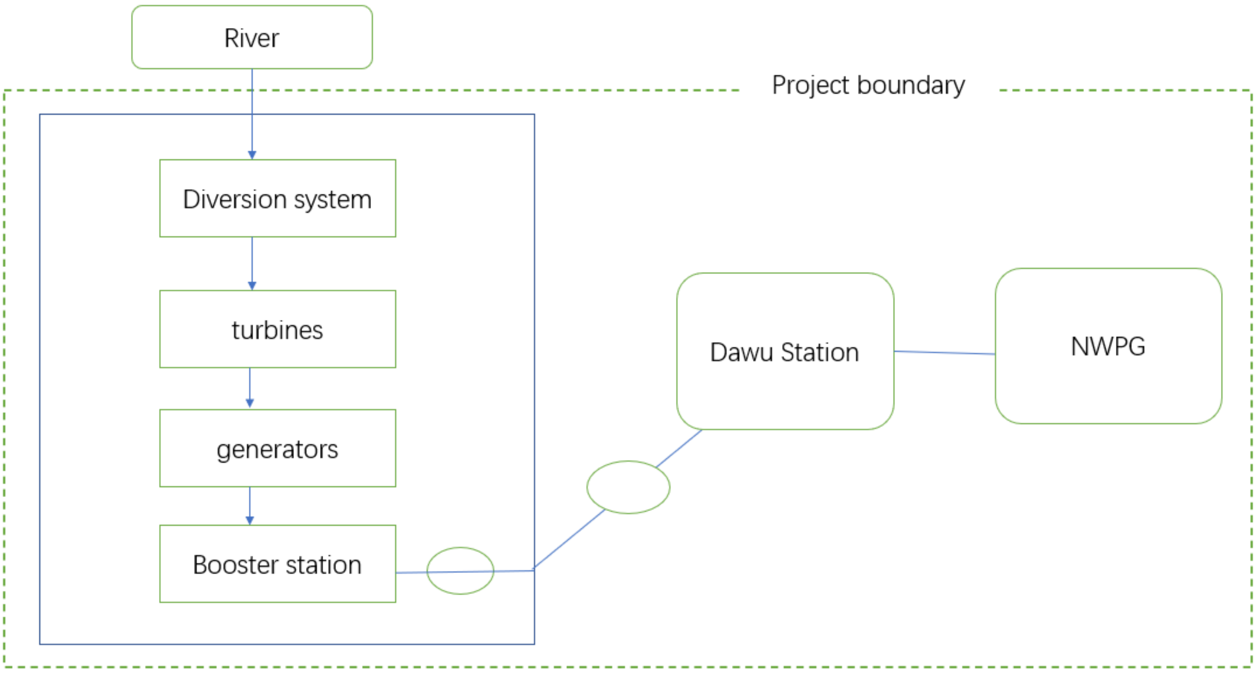

Figure B.3-1 Diagram of the project boundary

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 CDM Project Standard for Project Activities (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 activity 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

The baseline scenario of the project activity was the continuation of the current practice without any investment. The baseline emissions are primarily derived from the fossil fuel power plants in the NWPG. The total generation produced by fossil fuel power plants accounts for more than 50% of total electricity generation in NWPG in 2017 which is the latest grid data available for the project; and this percentage has not been changed significantly in recent 5 years. Therefore, market characteristics do not have impact on 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. According to the China Electric Power Yearbooks, presently the NWPG 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.
As there are no impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline scenarios, 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.

The project is a greenfield project with a lifetime of 20 operation years, with no baseline equipment(s) or an investment for the crediting period for which renewal is requested, this step is not applicable.

Step 1.4: Assessment of the validity of the data and parameters

The grid emission factor was determined at the start of the crediting period and was not monitored during the crediting period. The Designated National Authority (DNA) of China issued the notice "2019 Baseline Emission Factors for Regional Power Grids in China" on 29/12/2020, which is the latest grid data available for the project. The emission factors $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ of the NWPG the project connected is updated in the notice. The values of W_{OM} and W_{BM} also need to update for

the third crediting period as per the “Tool to calculate the emission factor for an electricity system” (Version 07.0). The parameters mentioned above which were determined at the start of the first crediting period are not valid for the crediting period to be renewed. Thus, the baseline emissions need to be updated with the application of the new data available.
As per the 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), through the application of Steps 1.1, 1.2, 1.3 and 1.4, it is confirmed that the current baseline is still valid for the subsequent crediting period. However, the data needs to be updated. Therefore, Step 2 needs to be applied.

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

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 baselineremains valid taking new relevant national and/or sectoral policies and circumstances into account.

Step 2.2 Update the data and parameters

Under the baseline scenario, the electricity that is produced under this project activity would be supplied from the NWPG. Therefore, the emission factor for NWPG is adopted as the value for $EF_{grid,CM,y}$. The calculation of grid power emission factor ($EF_{grid,CM,y}$) is in accordance with the “Tool to calculate the emission factor for an electricity system” (Version 07.0). In addition, the calculation also refers to “2019 Baseline Emission Factors for Regional Power Grids in China” published by Chinese DNA on 29/12/2020.
The updated baseline emission factor for the project ($EF_{grid,CM,y}$) is 0.5535 tCO_2/MWh, please refer to section B.6 for details.

B.5. Demonstration of additionality

>>
Not applicable for the second crediting period.
The project has demonstrated its additionality in the first crediting period and no changes affect the additionality of the project since its registration. As per the CDM Project Standard for project activities Version 02.0 para 280, the project participants are not required to reassess the additionality of the project activity and update the section relating to additionality.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

>>
According to ACM0002 (Version 20.0), project emissions, baseline emissions, leakage emissions and emission reductions are calculated as follows:

1. Project emissions

According to ACM0002 (Version 20.0), the project emission is calculated as follows:

$$PE_y=PE_{FF,y}+PE_{GP,y}+PE_{HP,y} \quad (1)$$

Where:

PE_y = Project emissions in year *y* (tCO_2e/yr)

$PE_{FF,y}$	=	Project emissions from fossil fuel consumption in year *y* (tCO_2/yr)
$PE_{GP,y}$	=	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e/yr)
$PE_{HP,y}$	=	Project emissions from water reservoirs of hydro power plants in year *y* (tCO_2e/yr)

The project is a hydro project, so $PE_{FF,y}$ and $PE_{GP,y}$ are considered zero according to methodology ACM0002(Version 20.0). Moreover, as described in the methodology, hydro power project activities that result in new reservoirs and hydro power project activities that result in the increase of existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoir.

In order to define calculation method, the power density is calculated bellow:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} = \frac{48000000w - 0w}{245900m^2 - 0m^2} = 195.2w/m^2 \quad (2)$$

Where:

PD	=	Power density of the project activity (W/m^2)
Cap_{PJ}	=	Installed capacity of the hydro power plant after the implementation of the project activity (W)
Cap_{BL}	=	Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero
A_{PJ}	=	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)
A_{BL}	=	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero

According to the ACM0002 (Version 20.0), if the power density of the project activity is greater than 10 W/m^2, the Project emissions ($PE_{HP,y}$) is zero. Through above calculation, the power density of the Project is 195.2W/m^2, therefore:

PE_y=0

2. Baseline emissions

According to the methodology, the baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \quad (3)$$

Where:

BE_y	=	The baseline emissions in year *y* (tCO_2/yr)
$EG_{PJ,y}$	=	The 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)
$EF_{grid,CM,y}$	=	The combined margin CO_2 emission factor for grid connected power generation in year *y* calculated (tCO_2/MWh)

Calculation of $EG_{PJ,y}$

The calculation of $EG_{PJ,y}$ is different for: (a) Greenfield plants, (b) retrofits and replacements; and (c) capacity additions. The Project Activity is a Greenfield plant.

(a) Greenfield renewable energy power plants

As the Project Activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, the following applies:

$$EG_{PJ,y} = EG_{facility,y} \quad (4)$$

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)

Calculation of $EF_{grid,CM,y}$

In line with the methodology, the baseline emission factor is calculated as a combined margin ($EF_{grid,CM,y}$), consisting of the combination of operating margin ($EF_{grid,OM,y}$) and build margin ($EF_{grid,BM,y}$) factors according to the following steps defined in "*Tool to calculate the emission factor for an electricity system*" .

Details of the calculations and data follow the published data from the Chinese DNA[3], which uses official national statistics.

Step 1. Identify the relevant electricity systems

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 (eg. 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.

The 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 Northwest China Power Grid (NWPG) is identified as the relevant electric power system of the project, which includes Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang Provincial Power Grids. According to the "2019 Baseline Emission Factors for Regional Power Grids in China", There is no net electricity imports to NWPG. Therefore, Northwest China Power Grid (NWPG) 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:

[3] http://www.mee.gov.cn/ywgz/ydqhbh/wsqtkz/202012/W020201229610353340851.pdf

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.

The Option I is chosen, because only grid power plants would be considered in the project electricity system.

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 one of the following methods:

(a) Simple OM; or
(b) Simple Adjusted OM; or
(c) Dispatch data analysis OM; or
(d) Average OM

The simple OM method (Option a) can only be used if any one of the following requirements is satisfied:

(a) Low-cost/must-run resources[4] constitute less than 50% of total grid generation (excluding electricity generated by off-grid power plants) in: 1) average of the five most recent years, and the average of the five most recent years shall be determined by using one of the approaches described below; or 2) based on long-term averages for hydroelectricity production.

(i) Approach 1

$$Share_{LCMR} = \text{average}\left[\frac{EG_{LCMR_{y-4}}}{total_{y-4}}, \ldots, \frac{EG_{LCMR_y}}{total_y}\right]$$

(ii) Approach 2

$$Share_{LCMR} = \frac{average\left(EG_{LCMR_{y-4}}, \ldots, EG_{LCMR_y}\right)}{average\left(total_{y-4}, \ldots, total_y\right)}$$

Where:

$Share_{LCMR}$	=	The share of the low cost/must run resources (%)
EG_{LCMRy}	=	The electricity generation supplied to the project electricity system by the low cost/must run resources in year *y* (MWh)
$totall_y$	=	The total electricity generation supplied to the project electricity system in year *y* (MWh)
y	=	The most recent year for which data is available

(b) The average amount of load (MW) supplied by low-cost/must-run resources in a grid in the most recent three years is less than the average of the lowest annual system loads (LASL) in the grid of the same three years.

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.

[4] Low-cost/must-run resources are defined as power plants with low marginal generation costs or dispatched independently of the daily or seasonal load of the grid. They include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If a fossil fuel plant is dispatched independently of the daily or seasonal load of the grid and if this can be demonstrated based on the publicly available data, it should be considered as a low-cost/must-run.

The Simple OM method (a) can only be used if the low-cost/must-run resources[4] constitute less than 50% of total grid generation in average of the five most recent years or based on long-term averages for hydroelectric production.

According to the data from China Electric Power Yearbook 2014-2018, from year 2013 to year 2017, for the NWPG the project activity connected to, the low-cost/must-run electric power resources generation accounts for the total grid generation are 23.47%, 23.54%, 24.13%, 24.29% and 27.54%, 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” (version 07.0), for the simple OM, the emissions 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 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;

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 calculating 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.

Therefore, the Ex-ante option is chosen.

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

The Simple OM method (Option a) was chosen in Step 3 above.

(a) Simple OM

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 sources serving the system, not including low-cost/must-run power plants/units.

The simple OM may be calculated by one of the following 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.

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 (i.e. if Option I has been chosen in Step 2).

Following the calculations of the DNA, Option B is chosen. The criteria for Option B are met:

(a) The necessary data for Option A is not available, as indicated in the calculations of the DNA; 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) Option I is chosen in Step 2.

Option B: Calculation based on total fuel consumption and electricity generation of the system

The simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \sum_i (FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}) / EG_y \quad (5)$$

Where:

$EF_{grid,OMsimple,y}$	=	The simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
$FC_{i,y}$	=	The amount of fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit)
$NCV_{i,y}$	=	The net calorific value (energy content) of fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	=	The CO_2 emission factor of fuel type *i* in year *y* (tCO_2/GJ)
EG_y	=	The 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 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

For this approach (simple OM) to calculate the operating margin, the subscript m refers to the power plants/units delivering electricity to the grid, not including low-cost/must-run power plants/units, and including electricity imports to the grid. Electricity imports should be treated as one power plant.

Based on these data are obtained from the China Electric Power Yearbook (2016~2018, published annually) and China Energy Statistical Yearbook (2016~2018)., the three-year average operating margin emission factor is calculated as a full-generation-weighted average of the emission factors. Details of the calculations and data follow the published data from the Chinese DNA[5], which uses official national statistics.

$EF_{grid,OMsimple,y}$ = 0.8922 tCO_2/MWh

<u>*Step 5. Calculate the build margin (BM) emission factor*</u>

In terms of vintage 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 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 activity or, if information

[5] http://www.mee.gov.cn/ywgz/ydqhbh/wsqtkz/202012/W020201229610353340851.pdf

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 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.

In this PDD, project participants choose "Option 1" to calculate BM ex ante and there is no need to update during the crediting period.

The sample group of power units are used to calculate the build margin should be determined as per the following procedure:

(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 (AEGSET-5-units,in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEGTotal,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% of AEGTotal (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) (SET≥20%) and determine their annual electricity generation (AEG≥20%,in MWh);

(c) From SET5-units and SET≥20% select the set of power units that comprises the larger annual electricity generation (SET sample);

Identify the data when the power units in SET sample started to supply electricity to the grid. If none of the power units in SET sample started to supply electricity to the grid more than 10 years ago, then use SET sample to calculate the build margin.

In China it is difficult to obtain the data of the five existing power plants built most recently and the power plants capacity additions in the electricity system that comprise 20% of the system generation and that were built most recently. Taking notice of this situation, EB accepts the following deviation in calculation of build margin emission factor:

- Capacity addition from one year to another is used as basis for determining the build margin, i.e. the capacity addition over 1-3 years, whichever results in a capacity addition that is closest to 20% of total installed capacity.

- Use proportional weights of installed capacity in place of electricity generation and plant efficiencies and emission factors of commercially available best practice technology in terms of efficiency. 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.

According to the "tool to calculate the emission factor for an electricity system" (Version 07), $EF_{grid,BM,y}$ is determined by the formula as follow:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (6)$$

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 efficiency. And finally, to multiply the thermal emission factor with the portion of the thermal power comprising 20% of the newly added capacity.

The calculation steps and formulas are as follows:

Sub-step 5.1 *Calculate the proportion of CO_2 emission caused by solid, liquid and gas fuels in the total emission respectively:*

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (7)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (8)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (9)$$

Where:

$F_{i,j,y}$ = the amount of fuel i (in a mass or volume unit) consumed by province j in year(s) y

$NCV_{i,y}$ = the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)

$EF_{CO2,i,j,y}$ = the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ)

Sub-step 5.2 *Calculate the emission factor of thermal power generation*

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \quad (10)$$

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 based and gas-based power generation technology commercially available in China.

Sub-step 5.3 *Calculate BM of the grid*

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad (11)$$

Where:

$CAP_{Total,y}$ = the total amount of incremental installed capacity;

$CAP_{Thermal,y}$ = the increased installed capacity of thermal power generation.

The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the China Energy Statistical Yearbook 2016-2018. The emission factors and oxidation factors of the fuels adopted are obtained from Table 1-4 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook.

The build margin emission factor is calculated using this methodology in the enclosed EF calculation spreadsheet:

$EF_{grid, BM, y}$ = 0.4407 tCO_2/MWh

Step 6. 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.

Option (a) is the preferred option. Option (b) cannot be used as the Project activity does not take place in an LDC or in a country with less than 10 registered projects. Therefore, Option (a) is chosen.

(a) Weighted average CM

The combined margin emissions factor is calculated as follows:

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

Where:

$EF_{grid,OM,y}$	=	The operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
w_{OM}	=	The weighting of operating margin emissions factor (%)
$EF_{grid,BM,y}$	=	The build margin CO_2 emission factor in year *y* (tCO_2/MWh)
w_{BM}	=	The weighting of build margin emissions factor (%)

According to the Tool, the default values for w_{OM} and w_{BM} for hydro projects in the second crediting period, which should be used, are: w_{OM} = 0.25 and w_{BM} = 0.75

Based on these weights for the second crediting period, the combined margin emission factor is calculated as given below.

	CO_2 emission factor (tCO_2/MWh)	Weighting (%)
Operating margin (see step 4)	0.8922	25%
Build margin (see step 5)	0.4407	75%
Combined margin	0.5535	-

These parameters will be recalculated at any renewal of the crediting period.

Baseline emissions (BE_y) now can be calculated as the annual net generation of the Project Activity (EG_y) multiplied by the combined margin CO_2 emission factor ($EF_{grid,CM,y}$).

3. Leakage

According to the ACM0002, no leakage emissions are considered.

4. Emission reductions

Emission reductions are calculated as follows:

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

Where:

ER_y	=	The emission reductions in year y (tCO_2e/yr)
BE_y	=	The baseline emissions in year y (tCO_2/yr)
PE_y	=	The project emissions in year y (tCO_2e/yr)

B.6.2. Data and parameters fixed ex ante

Data/Parameter	w_{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	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 $EF_{grid,CM,y}$
Additional comment	N/A

Data/Parameter	w_{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	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 $EF_{grid,CM,y}$
Additional comment	N/A

Data/Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2/MWh
Description	Operating margin emission factor for Northwest China Power Grid
Source of data	"2019 Baseline Emission Factors for Regional Power Grids in China" published by Chinese DNA
Value(s) applied	0.8922
Choice of data or measurement methods and procedures	Calculated follow the "Tool to calculate the emission factor for an electricity system" (Version 07.0) by Chinese DNA
Purpose of data	Calculation of $EF_{grid,CM,y}$
Additional comment	N/A

Data/Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	Build margin emission factor for Northwest China Power Grid
Source of data	“2019 Baseline Emission Factors for Regional Power Grids in China” published by Chinese DNA
Value(s) applied	0.4407
Choice of data or measurement methods and procedures	Calculated follow the “Tool to calculate the emission factor for an electricity system” (Version 07.0) by Chinese DNA
Purpose of data	Calculation of $EF_{grid,CM,y}$
Additional comment	N/A

Data / Parameter:	Cap_{BL}
Data unit	W
Description	Installed capacity of the hydro power plant before the implementation of the project activity
Source of data	Project site
Value(s) applied	0
Choice of data or measurement methods and procedures	Due to it is a new hydro power plant, according to ACM0002 (Version 20.0), this value is zero.
Purpose of data	Calculation of project emission
Additional comment	N/A

Data / Parameter:	A_{BL}
Data unit	m^2
Description	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2).
Source of data	Project site
Value(s) applied	0
Choice of data or measurement methods and procedures	Due to it is a new reservoir, according to ACM0002 (Version 20.0), this value is zero.
Purpose of data	Calculation of project emission
Additional comment	N/A

B.6.3. Ex ante calculation of emission reductions

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As explained in B.6.1, the project emissions and leakage emissions of the Project are all considered as zero. The baseline emissions in year *y* (BE_y) are calculated as

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

The net electricity of the project is 223,525MWh as estimated in FSR.

According to the above, the emission factor of NWPG is 0.5535tCO_2e/MWh.

Thus the baseline emission is

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} = 223{,}525MWh \times 0.5535tCO_2e/MWh = 123{,}721tCO_2e$$

The emission reductions for a given year are calculated as followed:

$ER_y = BE_y - PE_y - LE_y$=123,721 tCO_2e -0 tCO_2e-0 tCO_2e =123,721tCO_2e

Therefore, the Project will have an emission reduction estimated at 123,721tCO_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 ($t CO_2e$)
01/01/2021-31/12/2021	123,721	0	-	123,721
01/01/2022-31/12/2022	123,721	0	-	123,721
01/01/2023-31/12/2023	123,721	0	-	123,721
01/01/2024-31/12/2024	123,721	0	-	123,721
01/01/2025-31/12/2025	123,721	0	-	123,721
01/01/2026-31/12/2026	123,721	0	-	123,721
01/01/2027-31/12/2027	123,721	0	-	123,721
Total	866,047	0	-	866,047
Total number of crediting years	7			
Annual average over the crediting period	123,721	0	-	123,721

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter:	$EG_{facility,y}$
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied to grid in year y by the project plant
Source of data	meter
Value(s) applied	223,525
Measurement methods and procedures	Measured directly by electricity meters. The exact data will be the electricity delivered to the power grid minus the electricity supplied by the power grid.
Monitoring frequency	The data will be measured continuously and monthly aggregated.
QA/QC procedures	According to Technical administrative code of electric energy metering (DL/T448 – 2016), meters will be calibrated annually by an independent inspection authority. Data measured by meters will be cross checked by the electricity sales documents.
Purpose of data	Calculation of baseline emission
Additional comment	100% of data will be kept for two years after the end of the last crediting period or the last issuance of CERs for this Project, whichever occurs later.

Data / Parameter:	Cap_{PJ}
Data unit	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data	Project site
Value(s) applied	48,000,000
Measurement methods and procedures	Check the Generators' nameplates annually
Monitoring frequency	The data will be monitored annually
QA/QC procedures	-
Purpose of data	Calculation of project emission
Additional comment	Refer to B.7.3 Description of the monitoring plan

Data / Parameter:	A_{PJ}
Data unit	m^2
Description	Area of the reservoir measured in the surface of the water, after the implementation of the Project activity, when the reservoir is full.
Source of data	Project site
Value(s) applied	245,900

Measurement methods and procedures	Annual measured from topographical surveys, maps, satellite pictures, etc.
Monitoring frequency	The data will be measured annually
QA/QC procedures	-
Purpose of data	Calculation of project emission
Additional comment	Refer to B.7.3 Description of the monitoring plan

B.7.2. Sampling plan

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Not applicable.

B.7.3. Other elements of monitoring plan

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The monitoring plan is made according to *ACM0002 "grid-connected electricity generation from renewable sources" (Version 20.0)*. Monitoring procedure should be implemented firmly and responsibly by owner; the project owner should ensure that the emission reduction of the project activity during crediting period are calculated correctly.

1. Monitoring Data

Since the emission factor is calculated as *ex-ante* and according to the Monitoring Methodology ACM0002 (Version 20.0), the following data should be monitored:

a) Quantity of net electricity generation supplied by the project to the gird in year y ($EG_{facility,y}$)

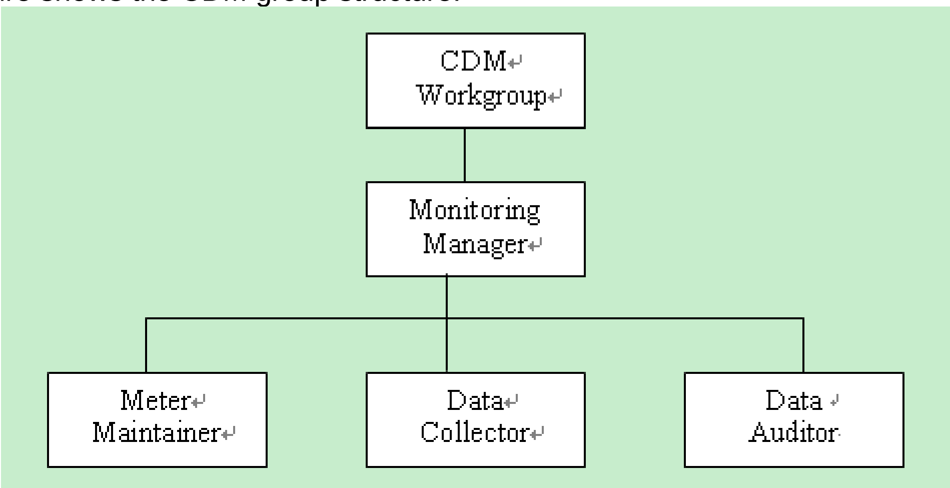
b) Installed capacity of the hydro power plant after the implementation of the project activity (Cap_{pj})

c) Area of the reservoir measured in the surface of the water, after the implementation of the Project activity, when the reservoir is full (A_{pj}).

2. Monitoring Organization

A CDM group will be established to carry out the monitoring plan. The project owner will designate a CDM manager to responsible for daily monitoring and reporting. Under the CDM manager, there will be three positions involved, respectively referred as meter maintainer, data collector and data auditor.

Followed figure shows the CDM group structure:



The CDM Manager is fully responsible for implementing monitoring plan and reviewing monitoring results.

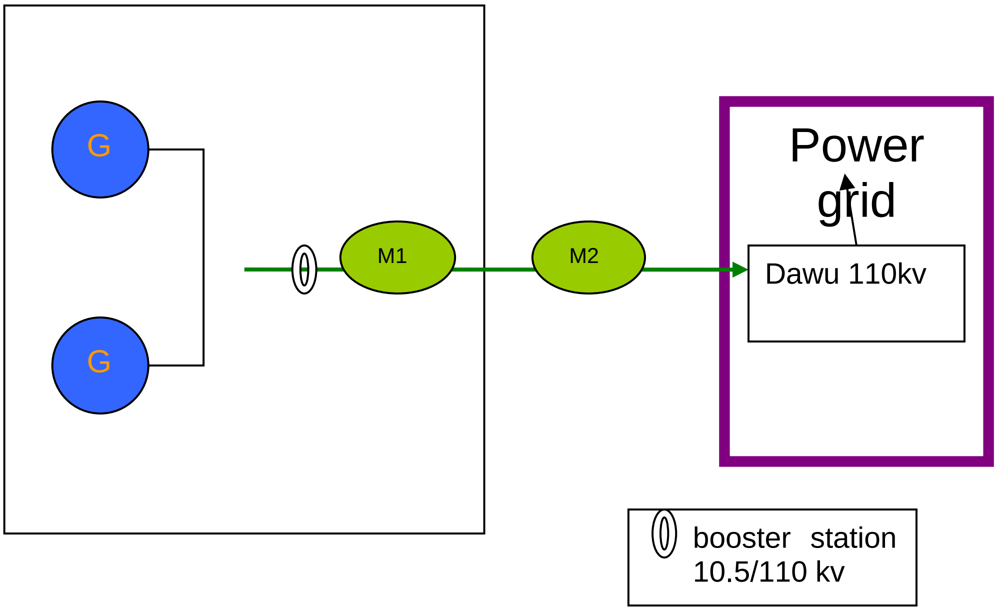
The maintainer is in charge of the organization of calibration tasks and regular maintenance of the meters equipped in the Project. The meters will be calibrated by specific technical staff and third party verification in accordance to relevant regulation and standard.

The Data collector is responsible for regular collecting of the financial data, including meters reading records and the electricity sales invoices or receipts. Those data will be audited and verified by the CDM group.

The Data Auditor will check the validity of the data by comparing with previous recorded data and data from third party such as the Power Corporation. If an obvious discrepancy does exist, it should be reported to Monitoring Manager. The validated data will be archived electronically in CDM data management system by the Data auditor.

3. Installation of meters

The metering equipment will be properly configured and checked annually according to the requirement from Technical administrative code of electric energy metering (DL/T448－2016), The metering equipment will be checked by the Project owner and Grid Company before operation. The diagram of the meters' position is shown as following:



The main meter M2 (accuracy level >=0.5S) is a bidirectional power meter that installed at the Grid Company, which will monitor the quantity of net electricity generation supplied by the Project to the grid ($EG_{facility,y}$) ie. The electricity exported to the grid by the project subtracts the electricity imported to the project from the grid. M2 owned and maintained by Qinghai Power Grid which belongs to NWPG. The backup meter M1 installed at the project site and monitored the electricity coming out from the plant to grid and the electricity received by the plant from the grid, M_1 owned and maintained by the project owner. The difference between M2 and M1 is the line loss.

4. Data Collection

The project owner is responsible for monitoring the meter M1 and the Grid Company is responsible for monitoring the main meter M2, and they should guarantee the measuring equipment are in good operation.

The main meter data collection process is presented as follow:

a) The project owner read M_1 on site hourly and record the data everyday
b) The power gird read M_2 monthly and recorded
c) At a fixed day of each month, Grid Company sends the project owner notification of net electricity generation. Then, the project owner offers the electricity sales invoices to Grid Company.

The project owner verified the installed capacity of the project on site annually and take a record. The area of reservoir measured in the surface of water when reservoir is full calculated annually using the schematics and area maps, etc, and the data will be recorded.

The QA&QC procedures for recording, maintaining and archiving data shall be optimized to ensure the Project provides credible, accurate, transparent and conservative monitoring data of the emission reductions.

5. Calibration

The calibration of electric energy meter should be annually carried out according to relevant National electric industry standards or regulations. After calibration, meters should be jointly inspected on behalf of the project owner and Grid Company and shall not be accessible by either party except in the presence of the other party or its accredited representatives.

All the meters installed shall be tested by the qualified metrical organization.

In Case of Emergency:

If the error of the main meter is out of the permissible limits, the data of the backup meter will be used to determine the electricity amount; the calculation of line loss can be determined by maximum historical records between M1 and M2. If both the main meter and the backup meter fail, the project owner and Grid Company shall jointly prepare a reasonable and conservative estimate of the correct reading. If the grid company and project owner can not determine a reasonable and accurate way to confirm the electricity generation during the meter failure period, then the electricity generated during this period will be neglected for conservative approach.

6. Data management system

All the data monitored under the monitoring plan will be kept for 2 years after the end of the last crediting period or the last issuance of CERs for this Project, whichever occurs later. The monitored data will be presented to DOE to for verification.

7. Monitoring Report

At the end of each crediting year, a monitoring report will be compiled including the metering results and evidence (i.e. sales receipts).

8. Personnel training

The monitoring plan needs to be executed by qualified professionals, thus the project owner will train the relevant personnel.

The training will make sure the relevant personnel to master the necessary mechanical, electric and installing knowledge, know well the working principle and the fundamental structure of generator, understand the reasons of common malfunction and the corresponding solving methods, expertly use the monitoring system. If personnel alternation happens, the worker taking over should be ensured to receive the same training.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

>>

04/07/2011(the construction contract of dam was signed), which was determined in the registered PDD.

C.2. Expected operational lifetime of project activity

>>

20 years 0 months

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

>>
The start date of the second crediting period is 01/01/2021.

C.3.3. Duration of crediting period

>>
7 years 0 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

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According to China Environmental Protection Law, the Project owner entrusted Qinghai environmental science research institute to compile Environmental Impact Assessment (EIA) report for the Project. The Project EIA report was completed in 08/2010 and approved by the Department of Environmental Protection of Qinghai Province on 15/09/2010. The main assessment conclusions are provided below:

Construction Phase

Water Environment
In construction period, there are mainly four impacts, respectively rock excavation and foundation trench drainage, processing wastewater of sandstone, oily sewage and sanitary waste. Excavation and foundation trench drainage will change water quality in the downstream obviously, mainly manifesting as suspended substance increased in the water contents and thus the water become muddy.

Air environment
The main pollutant source is from fuel oil of construction machinery and vehicles and open blasting. In addition the construction of sand area pollutes air environment. However, the amount and diffusion range of pollutants in ambient air is limited, thus the impact of these pollutants is slight.

Acoustical Environment
Noise source of the Project is mainly from earthwork during the construction phase and motor vehicles.

Ecological environment
Impact on species such as terrestrial ecology, terrestrial animal and soil environment is presented below.

a) Impact on terrestrial ecology
The impact is resulted from vegetation deterioration and soil erosion. After construction, the area temporarily occupied will be recovered through maintained and planting.
b) Impact on terrestrial animal
The impact resulted from changes of animal living environment. However, these changes are not significant, such as water, air, noise. The animal disturbed can find new suitable habitat nearby.
c) Impact on soil environment
The soil environment impact is posed by two parts. One is the permanent loss due to buildings. Other is damage of surface soil layer. The ways of organic exchange is blocked and soil is lost. During construction, the impact will be minimized and after construction, the recovery work will be carried out.

Solid waste
The solid waste consists of construction waste and household waste of workers. They are out of the list of poisonous and harmful waste.

Operation Phase

Hydropower is clean energy. During operation period, there is no pollutant from station. The environmental factors influenced are water, geology and ecology.

Impact on climate
The influence of climate is resulted from difference of the heat transfer and distribution during reservoir operation. It occurs in the large project. In this project, the influence can be neglected.

Impact on water environment
The sediment imposes the main impact on water of river and reservoir. The conservation measures of soil are taken to reduce the soil loss in the upstream. Meanwhile, the amount of sediment in reservoir is little through its designing and layout such as sand wash treatment measures. The amount of sediment is little, so its impact on quality of water and aquatic animals is little.

In the reservoir region, the surface area of water is increased because of storing water. And the flow rate of river is decreased. As a result, the quality of downstream water is improved with the increasing process time of natural purifying effect.

Impact on inundated area
The most of inundated area is cliff without minerals or street furniture or farm or protection zone. The families in this area are few. So there is no Submerged problem existing.

Mitigation measures

1) waste water

The oil separator is set up for the oily sewage whose floating oil can be recovered. Then waste water of construction is treated with flocculation and mechanical dewatering. The sanitary wastewater is collected to sedimentation basin. The waste water treated can be reuse for dust fall and irrigation to minimize the waste water discharged into environment.

2） air environment and noise

Corresponding measures will be adopted to reduce the impacts. In addition, focus will be put on the construction personnel. Protective measures, such as wearing dust masks, ear plugs, etc., will be equipped to prevent health hazards from dust and earplugs, earmuffs, or helmets etc. will be provided for the sake of personnel. These impacts will disappear after the completion of the Project.

3） Solid waste

They are collected in time and treated as the landfill process. And the conservation measures of water and soil in residue place is taken. Thus it will not affect much on the surrounding environment

4） Ecology

According to the national policies and regulations, the ecology is recovered by planting in area temporarily occupied. In addition, the design and technology of EIA is strictly complied with to minimize the area disturbed. And the public education is carried out to workers.

In conclusion, environmental impacts arising from the project are considered insignificant. The insignificant impacts on environment could be solved by protection measures.

D.2. Environmental impact assessment

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According to EIA results and reply from Department of Environmental Protection of Qinghai Province, the impact on the environment is not significant.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

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To investigate the impacts on local socio-economy and environment, the Project owner conducted a public meeting on 16/04/2011[6]. Before that, on 06/04/2011, the project owner has published a notice on its Bulletin board to invite potential stakeholders to attend the meeting and give comments. The survey was arranged through delivering questionnaires among local residents (especially Dawu town) at the project site.

E.2. Summary of comments received

>>

50 questionnaires copies were delivered and all of them available. The survey had a 100% response rate.

Details of the stakeholders taken part in the survey are showed in the Table E.2-1 and E.2-2.

Table E.2-1 Details of the stakeholders for the Project

Item		total	percentage
Age（year）	30	7	14
	39-40	10	20
	40-49	21	42
	50-59	7	14
	above 60	5	10
Profession	Farmer	33	66
	other	17	34
Education level	Preliminary school	12	24
	Junior high school	29	58
	Senior high school	7	14
	other	2	4

Table E.2-2 Results of the survey

Content		Statistical Results	
		total	%
1. What's your attitude towards the Project?	support	46	92
	indifference	4	8
	objection	0	0

[6] The meeting minute of the Project stakeholder comment results (16/04/2011).

2. Do you think the Project has an effect on the local socio-economy and environment?	positive	36	72
	passive	2	4
	no effect	12	24
3. Do you think the construction of the Project will bring employment opportunities to local people?	yes	50	100
	no	0	0
4. What's your opinion about the influence the Project caused?	positive effect	27	54
	Some influence but acceptable	19	38
	no effect	4	8
5. Do you think the project should be built as soon as possible?	yes	41	82
	no	0	0
	indifference	9	18
6. Will the Project have impact on your work and life?	large influence	2	4
	little influence	14	28
	no influence	34	68
7. What role do you think CDM plays in the Project?	positive	16	32
	no effect	0	0
	Improve local clean energy usage	34	68

Conclusion

The public investigation shows that most respondents support the construction of the Project, and all of them insist that this Project is beneficial to the local development. There are some concerns on the impacts in the construction phase, but according to the description in EIA all problems can be solved by applying the advanced technology and adopting environmental protection measures.

E.3. Consideration of comments received

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The environmental concerns from the respondents are seriously considered by the Project owner and will be solved by applying the related measures. All the comments received which strongly show a positive attitude in supporting the construction of the Project have been integrated into the Project construction phase plan and earnestly implemented.

SECTION F. Approval and authorization

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Letter of approval by China DNA was issued on 28/03/2012.
Letter of approvals by buyer parties were issued on 24/09/2012 (UK), 15/06/2016 (UK) 16/08/2016(Finland) , which are available on:
https://cdm.unfccc.int/Projects/DB/CEPREI_Cert1348816448.95/view

Appendix 1. Contact information of project participants

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Appendix 2. Affirmation regarding public funding

Not Applicable. There is no public funding from UNFCCC Annex 1 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

All the details on monitoring plan are described in B.7.

Appendix 6. Summary report of comments received from local stakeholders

All the details on comments received from local stakeholders are described in Section E.

Appendix 7. Summary of post-registration changes

The project was registered on 03/10/2012. There are no post-registration changes.

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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.

Version	*Date*	*Description*
07.0	15 April 2016	Revision to ensure consistency with the “Standard: Applicability of sectoral scopes” (CDM-EB88-A04-STAN) (version 01.0).
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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