

Gold Standard for the Global Goals
Transition Annex
*(To be used by all GS CDM/VER stand alone projects and PoAs,
Micro Scale stand alone projects and Micro PoAs)*



Version 1 – September 2017

KEY PROJECT INFORMATION

Title of Project/PoA/Activity:	Hunan Guanbaodu-Liangjiangkou Small-scale Hydropower Bundle Project
GS ID of the project/PoA/activity:	835
GS Version:	1.0
Brief description of Project:	The Hunan Guanbaodu-Liangjiangkou Small-scale Hydropower Bundle Project consists of two hydropower projects, the Guanbaodu hydropower project located in Jingzhou County and the Liangjiangkou hydropower project located in Tongdao County. Both of these two counties belong to Huaihua City, Hunan Province. The total installed capacity of the bundle project is 5.89 MW with annual expected net electricity generation (electricity supplied to power grid) of 21,612MWh.
Project type: Energy/Land Use	Renewable Energy
For Renewable Energy Projects – intention to apply RECs Labels (y/n)	n
GS Stream (CDM/VER):	VER
Scale (large/scale/micro):	Small-scale
GS Registration Date:	31/12/2010
GS Crediting period start date:	01/01/2009 (first renewable crediting period) 01/01/2016 (second renewable crediting period)
CDM Registration Date:	/
CDM Crediting period start date:	/
Project Developer:	Climate Bridge Ltd.
Project Representative:	Climate Bridge Ltd.
Project Participants and any communities involved:	Jingzhou Miao & Dong Autonomous County Guanbaodu Hydropower Co., Ltd (project owner of Guanbaodu hydropower project) Tongdao Dong Autonomous County Liangjiangkou Hydropower Station (project owner of Liangjiangkou hydropower project) Climate Bridge Ltd. (buyer)
Host Country/Location:	P.R.China (host)
Methodologies applied:	ACM0002 (Version 16.0)
SDG Impacts:	SDG 5 Impacts SDG 7 Impacts SDG 8 Impacts Certified SDG 13 Impacts – Emission reductions
Estimated amount of SDG Impact (GSVERs and others)	12,930 t GSVERs/year

NOTE: This Annex shall be used for all PoAs if the sustainable development assessment is conducted at PoA level. In case sustainable development assessment is conducted at activity level, then this Annex shall be filled for each of the activities.

SECTION A Sustainable Development Goals (SDG) outcomes

A.1 Relevant target for each of the three SDGs

>> (Specify the relevant SDG target for at least each of three SDGs addressed by the project. Refer most recent version of targets [here](#). Contribution to SDG 13 is mandatory to be demonstrated for all projects and activities. Contribution to SDG 7 is recommended to be demonstrated for all community service projects and activities)

1. SDG 5: Gender and equality: Achieve gender equality and empower all women and girls

Target 5.1: End all forms of discrimination against all women and girls everywhere

1) Guanbaodu

This project offered 2 permanent job opportunities for local women who enjoy the basic right and holiday for female employees. Therefore, Guanbaodu achieved the SDG target 5.1: End all forms of discrimination against all women and girls everywhere.

2) Liangjiangkou

This project provided 2 part-time job opportunities to females for financing work. Their salary is the same as the male part-time employees. Therefore, Liangjiangkou achieved the SDG target 5.1: End all forms of discrimination against all women and girls everywhere.

2. SDG 7: Affordable and clean energy: Ensure access to affordable, reliable, sustainable and modern energy for all

Target 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix

1) Guanbaodu

The electricity from the project activity will be delivered to Jingzhou County Grid, thus alleviating the power shortage in the county, at the meantime, increasing the use and diversity of natural resources. And the electricity generated by the project partially replaces electricity generation from other conventional sources of energy, and directly reducing emissions other than GHG such as SOx and NOx (N₂O excluded). Therefore, Guanbaodu achieved the SDG target 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix.

2) Liangjiangkou

The electricity from the project activity will be delivered to Tongdao County Grid, thus alleviating the power shortage in the county, at the meantime, increasing the use and diversity of natural resources. During the operation period, the electricity generated by the project partially replaces electricity generation from other conventional sources of energy, and directly reducing emissions other than GHG such as SOx and NOx (N₂O excluded). Therefore, Liangjiangkou achieved the SDG target 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix.

3. SDG 8: Decent work and economic growth: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Target 8.3: Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services

Target 8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value

1) Guanbaodu

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During the construction and operation phases, some job opportunities are provided to local people. Some basic trainings are provided to relevant staff which will help them upgrade their skills and knowledge. Additionally, comprehensive insurance has been provided to every permanent employee. The project achieved SDG target 8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value. And Some employment opportunities increase the income of local people. The income for permanent employees is in range of 1,100-3,773 RMB/month, higher than the average level 838 RMB/month in rural area of Hunan Province. In addition, local residents earn more as being a worker in the hydro power plant than being a farmer. The local villagers also invested in the project. The village committee made the investment on behalf of them. When the project operation started, they received their share of the annual profit in return. Therefore, Guanbaodu achieved the SDG target 8.3: Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services.

2) Liangjiangkou

During the construction and operation phases, some job opportunities are provided to local people. Some essential training opportunities are provided to relevant staff which will help them upgrade their skills and knowledge. Additionally, accident insurance has been provided to every permanent employee. The project achieved SDG target 8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value. Some employment opportunities increase the income of local people. The income for permanent employees is in range of 1,200-2,000 RMB/month, higher than the average level 838 RMB/month in rural area of Hunan Province. Besides energy service, the project activity also brings other essential services to local community: 1. three bridges have been built; 2. pumping pipelines for local resident have been established; 3. some small docks have been built for daily life. Totally, the project developer has contributed 351,000RMB for local services. Therefore, Liangjiangkou achieved the SDG target 8.3: Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services.

4. SDG 13: Climate action

Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

1) Guanbaodu

The operation of Guanbaodu project will displace equivalent power generated from Central China Power Grid (hereafter referred to as "CCPG") which is mainly dominated by fossil fuel fired power plants. It helps to reduce greenhouse gas (GHG) emissions by an estimated 9,281 tCO₂e per year during the second crediting period.

During the operation period, the electricity generated by the project partially replaces electricity generation from other conventional sources of energy, and directly reducing emissions other than GHG such as SO_x and NO_x (N₂O excluded), which contributes to the air quality improvement to a certain extent. Additionally, the project carries out the proper measures to mitigate the air pollution comes from project construction. Therefore, Guanbaodu achieved the SDG target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

2) Liangjiangkou

The operation of Liangjiangkou project will displace equivalent power generated from CCPG which is mainly dominated by fossil fuel fired power plants. It helps to reduce greenhouse gas (GHG) emissions by an estimated 3,649 tCO₂e per year during the second crediting period.

During the operation period, the electricity generated by the project partially replaces electricity generation from other conventional sources of energy, and directly reducing emissions other than GHG such as SO_x and NO_x (N₂O excluded), which contributes to the air quality improvement to a certain extent. Additionally, the project carries out the proper measures to mitigate the air pollution comes from project construction.

Therefore, Liangjiangkou achieved the SDG target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

A.2 Explanation of methodological choices/approaches for estimating the SDG outcome

>> (Explain how the methodological steps in the selected methodology(ies) or proposed approach for calculating baseline and project outcomes are applied. Clearly state which equations will be used in calculating net benefit.)

CDM methodology ACM0002 (Version 16.0) was applied for calculation baseline and project outcomes before transition, and according to Section 3.5 of the GS4GG Requirements&Guidelines for the Transition of Project from Previous Versions of the Standard, transition of a project to GS4GG during the ongoing crediting period will not affect its eligibility under the standard, applicability of applied methodology and additionality already demonstrated. So the methodology ACM0002 (Version 16.0) is applicable for the project.

And according to ACM0002, the following steps are used to calculate the net benefit of the project which contributing SDG 13 target: Emission reductions (GSVERs).

1. Calculation of baseline emissions

According to ACM0002 (Version 16.0), 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 to be calculated as follows:

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

Where:

BE_y = Baseline emissions in year y (t CO₂/y).

$EG_{PJ,y}$ = 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).

$EF_{grid,CM,y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system (tCO₂/ MWh)

According to the "Tool to calculate the emission factor for an electricity system" (Version 05.0), the following 6 steps are employed to determine the OM, BM, and CM used for calculating project baseline emissions:

Step 1: Identify the relevant electricity system

In accordance with delineations of connected electricity systems by China NRDC₄ (China's DNA), Central China Power Grid (CCPG) is the connected electricity system for the project as it is connected by transmission lines to the project electricity system. CCPG covers the power grids of Henan Province, Hubei Province, Hunan Province, Sichuan Province, Jiangxi Province and Chongqing City according to the delineations published by China's DNA.

Step 2: Choose whether to include off-grid power plants in the project electricity system

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

Option I is adopted for calculation for the bundle project.

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

The calculation of 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 bundle project applies method (a) simple OM since low-cost/must-run resources constitute less than 50% of total grid electricity generation of CCPG in the most recent 5 years (2008-2012). According to China Electric Power Yearbook (2009-2013 Edition), the amount of low-cost/must-run resources accounts for about 39.27%, 40.85%, 37.63%, 33.84% and 40.75% in year 2008 to 2012 respectively, all less than 50%.

The Simple OM emission factor can be calculated using either of the two following data vintages:

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- Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of VER-PDD to the DOE for validation, without requirement to monitor and recalculate the emission factor during the crediting period, or
- Ex post option: The year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring.

This PDD uses Ex ante Option for $EF_{grid,OM,y}$ calculation to be in accordance with the baseline emissions factor for regional power grids published by China DNA.

Table D-1 Power Generation of CCPG in 2008

Province	Thermal	Hydro	Nuclear	Wind	Others	Total	low-cost/must-run resources
	(GWh)	(GWh)	(GWh)	(GWh)	(GCCWh)	(GWh)	(GWh)
Jiangxi	40,500	8,900	0	0	0	49,400	
Henan	189,000	8,100	0	20	0	197,120	
Hubei	55,300	119,900	0	20	0	175,220	
Hunan	53,700	31,200	0	0	0	84,900	
Chongqing	28,600	11,600	0	0	0	40,200	
Sichuan	40,100	83,600	0	0	0	123,700	
Total	407,200	263,300	0	40	0	670,540	
Percentage	60.73%	39.27%	0.00%	0.01%	0.00%	100%	39.27%
China Electric Power Yearbook 2009							

Table D-2 Power Generation of CCPG in 2009

Province	Thermal	Hydro	Nuclear	Wind	Others	Total	low-cost/must-run resources
	(GWh)	(GWh)	(GWh)	(GWh)	(GCCWh)	(GWh)	(GWh)
Jiangxi	44,500	7,800	0	110	0	52,410	
Henan	198,500	8,200	0	100	0	206,800	
Hubei	6,300	116,700	0	20	0	123,020	
Hunan	63,400	31,900	0	2	0	95,302	
Chongqing	30,600	12,500	0	10	0	43,110	
Sichuan	50,400	94,500	0	0	0	144,900	
Total	393,700	271,600	0	242	0	665,542	
Percentage	59.15%	40.81%	0.00%	0.04%	0.00%	100%	40.85%
China Electric Power Yearbook 2010							

Table D-3 Power Generation of CCPG in 2010

Province	Thermal	Hydro	Nuclear	Wind	Others	Total	low-cost/must-run resources
	(GWh)	(GWh)	(GWh)	(GWh)	(GCCWh)	(GWh)	(GWh)
Jiangxi	53,700	10,100	0	140	0	63,940	
Henan	219,800	8,500	0	110	0	228,410	
Hubei	77,100	124,600	0	70	1	201,771	
Hunan	72,500	37,500	0	40	0	110,040	
Chongqing	33,100	14,300	0	50	0	47,450	
Sichuan	56,500	113,900	0	0	0	170,400	
Total	512,700	308,900	0	410	1	822,011	
Percentage	62.37%	37.58%	0.00%	0.05%	0.00%	100%	37.63%
China Electric Power Yearbook 2011							

Table D-4 Power Generation of CCPG in 2011

Province	Thermal	Hydro	Nuclear	Wind	Others	Total	low-cost/must-run resources
	(GWh)	(GWh)	(GWh)	(GWh)	(GCCWh)	(GWh)	(GWh)
Jiangxi	66,500	7,500	0	220	4	74,224	
Henan	249,800	9,800	0	170	0	259,770	
Hubei	93,300	116,700	0	150	3	210,153	
Hunan	89,900	30,400	0	50	0	120,350	
Chongqing	38,700	14,600	0	100	0	53,400	
Sichuan	59,600	126,100	0	20	0	185,720	
Total	597,800	305,100	0	710	7	903,617	
Percentage	66.16%	33.76%	0.00%	0.08%	0.00%	100.00%	33.84%
China Electric Power Yearbook 2012							

Table D-5 Power Generation of CCPG in 2012

Table D-3 Power Generation of CEE, GWh, 2012								
Province	Thermal	Hydro	Nuclear	Wind	Wind	Others	Total	low-cost/must-run resources
	(GWh)	(GWh)	(GWh)	(GWh)	(GWh)	(GCCWh)	(GWh)	(GWh)
Jiangxi	61,000	14,600	0	320	10	0	75,930	
Henan	246,500	12,800	0	330	0	0	259,630	
Hubei	86,300	138,000	0	200	10	0	224,510	
Hunan	76,500	44,600	0	270	0	0	121,370	
Chongqing	33,600	21,000	0	80	0	0	54,680	
Sichuan	58,400	154,500	0	40	0	0	212,940	
Total	562,300	385,500	0	1,240	20	0	949,060	
Percentage	59.25%	40.62%	0.00%	0.13%	0.00%	0.00%	100.00%	40.75%
	China Electric Power Yearbook 2013							

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

The simple OM emission factor is calculated as the generation-weighted average CO₂ emission per unit net electricity generation (tCO₂e/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units. The following choices can be calculated:

Option A: Based on the net electricity generation and a CO₂ emission factor of each power unit; or

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

In accordance with the guideline of China's DNA, Option B is used for calculating project OM since the necessary data for Option A is not available as follows:

$$EF_{grid,CMsimple,y} = \frac{\sum FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{EG_y} \quad (2)$$

Where:

EF_{grid,OMsimple,y} = Simple operating margin CO₂ emission factor in year y (tCO₂e/MWh)

FC_{i,y} = Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)

NCV_{i,y} = Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)

EF_{CO₂,i,y} = CO₂ emission factor of fossil fuel type i in year y (tCO₂e/GJ)

EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year y (MWh)

i = All fossil fuel types combusted in power sources in the project electricity system in year y

y = The three most recent years for which data is available at the time of submission of the VER-PDD to the DOE for validation (ex ante option).

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According to the above formulae (2) and statistical information from the last three most recent years (2010-2012) where the data are the latest and available at the time of this PDD submission, the $EF_{grid,OMsimple,y}$ is calculated to be 0.9724 tCO₂e/MWh.

Step 5: Calculate the build margin emission factor (BM)

In terms of vintage of data, project participants can choose between one of the following two steps:

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 VER-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 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.

The PDD choose Option 1, which requires the project participant to update the Build Margin Emission Factor ex-ante 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.

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

- (a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently (SET_{5-units}) and determine their annual electricity generation (AEG_{SET-5-units}, in MWh);
- (b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20 per cent of AEG_{total} (if 20 per cent falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET \geq 20$ per cent) and determine their annual electricity generation (AEG_{SET- ≥ 20 per cent}, in MWh);
- (c) From SET_{5-units} and $SET \geq 20$ per cent select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Otherwise:

- (d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activity, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20 per cent of the annual electricity generation of the project electricity system (if 20 per cent falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set (SET_{sample-CDM}) the annual electricity generation (AEG_{SET-sample-CDM}, in MWh);

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

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

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

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The build margin emissions factor is the generation-weighted average emission factor (tCO₂e/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

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

Where:

$EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (CO₂e/MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ = CO₂ emission factor of power unit m in year y (tCO₂e/MWh)

m = Power units included in the build margin

y = Most recent historical year for which power generation data is available

However, in China it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that were built most recently. Due to the fact that the no plant specific generation and fuel consumption is currently available in China, BM calculation adopts the following deviation¹ in methodology application:

First, calculate the newly added installed capacity and the various components of power generation technologies, then calculation of the weight of newly added installed capacity of each power generation technology. Finally the commercial and efficient level of each power generation technology is adopted to calculate BM emission factor.

Since the generating capacity of coal-fired, oil-fired and gas-fired technologies can not be separated from the existing statistical data, the BM calculation in this PDD adopts the following method:

Firstly, based on the available data in the energy balance tables of the latest year, determine the ratio of CO₂ emissions from coal, oil and gas fuels consumption for power generation to total CO₂ emissions;

Secondly, take the ratio as the weight, based on the emission factors in terms of optimal efficiency and commercial technologies, calculate the emission factor of the thermal power in each grid;

Thirdly, this thermal emission factor is multiplied by the portion of thermal power added capacity in the newly additional 20% capacity. The result is the BM emission factor of grid.

Concrete steps and the formula for BM calculation are as follows:

Sub-Step 1: Calculate the proportion of CO₂ emissions from solid, liquid and gaseous fuels corresponding to the total CO₂ emissions.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (4)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (5)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (6)$$

Where:

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

$NCV_{i,y}$ = The net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)

$EF_{CO_2,i,j,y}$ = CO₂ emission factor of fossil fuel type i in province j in year y

Coal, Oil and Gas is the feet for solid fuels, liquid fuels and gaseous fuels.

¹ <http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM>

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Sub-Step 2: Calculate the emission factor of thermal power

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

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$, $EF_{Gas,Adv}$ are the emission factors of the optimal efficient and commercial coal-fired, oil-fired and gas-fired generation technologies, respectively.

Sub-Step 3: Calculation of BM in the grid

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

Where:

$CAP_{thermal,y}$ = The capacity addition of thermal power generation sources (MW) in year y

$CAP_{total,y}$ = The total capacity addition of all types of power generation sources (MW) in year y which is close to but less than 20% of the existing installed capacity

$EF_{Thermal,y}$ = The emission factor of thermal power plants in year y

According to the latest and available data at the time of this submission of the request for renewal of the crediting period to the DOE, $EF_{grid,BM,y}$ is calculated to be 0.4737 tCO₂e/MWh.

Step 6: Calculate the combined margin emission factor

The combined margin emissions factor is calculated as follows:

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

Where:

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

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

For hydro power projects, the weight ω_{OM} and ω_{BM} , by default, are 25% and 75% respectively in the second crediting period.

Therefore, the combined baseline emission factor of CCPG is:

$$EF_{grid,CM,y} = 0.9724 \times 25\% + 0.4737 \times 75\% = 0.5983 \text{ tCO}_2\text{e} / \text{MWh}$$

The calculation of $EG_{PJ,y}$ is different for Greenfield plants, capacity additions, retrofits, rehabilitations, and replacements. According to the methodology, if the project activity is the installation of a Greenfield power plant, then:

$$EG_{PJ,y} = EG_{facility,y} \quad (10)$$

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 project activity in year y (MWh).

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

2. Calculation of project emissions

According to ACM0002, project emissions can be calculated as follows:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad (11)$$

Where:

PE_y = Project emissions in year y (tCO₂e/yr)

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (tCO₂/yr)

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO₂e/yr)

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year y (tCO₂e/yr)

According to ACM0002, for all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected, so $PE_{FF,y} = 0$.

The project is not a geothermal power plant, thus $PE_{GP,y} = 0$.

Therefore, $PE_y = PE_{HP,y}$

The proposed hydropower project is a new project and results in a new reservoir, and its power density of is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad (12)$$

Where:

PD=Power density of the project activity (W/m²)

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 (m²)

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 (m²). For new reservoirs, this value is zero

For the bundled two projects, for Guanbaodou:

Cap_{BL} = 0, A_{BL} = 0, Cap_{PJ}= 4MW, and A_{PJ}= 327,000 m², therefore PD=12.23 W/m², which is greater than 10W/m²; and for Liangjiangkou,

Cap_{BL} = 0, A_{BL} = 0, Cap_{PJ}= 1.89MW, and A_{PJ}= 177,500 m², therefore PD=10.65 W/m², which is greater than 10W/m².

Therefore, according to ACM0002, PE_{HP,y} = 0, so PE_y = PE_{HP,y} = 0.

3. Calculation of leakage emissions

According to ACM0002, no leakage emissions are considered.

4. Calculation of emission reductions

According to methodology ACM0002, emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad (13)$$

Where:

ER_y = Emission reductions in year y (tCO₂e/yr)

BE_y = Baseline emissions in year y (tCO₂e/yr)

PE_y = Project emissions in year y (tCO₂e/yr)

A.3 Data and parameters fixed ex ante for monitoring contribution to each of the three SDGs

(Include a compilation of information on the data and parameters that are not monitored during the crediting period but are determined before the design certification and remain fixed throughout the crediting period like IPCC defaults and other methodology defaults. Copy this table for each piece of data and parameter.)

Relevant SDG Indicator	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data/parameter	EF _{grid,OM,y}
Unit	tCO ₂ e/MWh
Description	Operating margin emission factor for East China Power Grid
Source of data	The weighted average emission factors of year 2010-2012 China DNA
Value(s) applied	0.9724
Choice of data or Measurement methods and procedures	Calculated as per the latest version of "Tool to calculate the emission factor for an electricity system" (version 05.0) by China DNA
Purpose of data	Calculation of EF _{grid,CM,y}
Additional comment	Calculated ex ante and fixed for the second crediting period

Relevant SDG Indicator	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
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Data/parameter	$EF_{grid,BM,y}$
Unit	tCO ₂ e/MWh
Description	Build margin emission factor for East China Power Grid
Source of data	Caculation after considering the installed capacity and shut down unit capacity
Value(s) applied	0.4737
Choice of data or Measurement methods and procedures	Calculated as per the latest version of "Tool to calculate the emission factor for an electricity system" (version 05.0) by China DNA
Purpose of data	Calculation of $EF_{grid,CM,y}$
Additional comment	Calculated ex ante and fixed for the second crediting period

Relevant SDG Indicator	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data/parameter	ω_{OM}
Unit	-
Description	Weighting of operating margin emissions factor
Source of data	"Tool to calculate the emission factor for an electricity system" (version 05.0)
Value(s) applied	0.25
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of $EF_{grid,CM,y}$
Additional comment	Calculated ex ante and fixed for the second crediting period

Relevant SDG Indicator	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data/parameter	ω_{BM}
Unit	-
Description	Weighting of build margin emissions factor
Source of data	"Tool to calculate the emission factor for an electricity system" (version 02.0)
Value(s) applied	0.75
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of $EF_{grid,CM,y}$
Additional comment	Calculated ex ante and fixed for the second crediting period

Relevant SDG Indicator	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data/parameter	EF _{grid,CM,y}
Unit	tCO ₂ e/MWh
Description	Baseline emission factor for East China Power Grid
Source of data	"2010-2012 Baseline Emission Factors for Regional Power Grids in China" published by China DNA
Value(s) applied	0.5983
Choice of data or Measurement methods and procedures	Calculated as per the latest version of "Tool to calculate the emission factor for an electricity system" (version 05.0) by China DNA
Purpose of data	Baseline emission calculation
Additional comment	Calculated ex ante and fixed for the second crediting period

SECTION B Safeguarding Principles Assessment

B.1 Analysis of social, economic and environmental impacts

>> (Refer the GS4GG Safeguarding Principles and Requirements document for detailed guidance on carrying out this assessment. The assessment of following Safeguarding Principles Assessment is required to be carried out by GS Version 2.0, 2.1 and 2.2 projects. GS v1.0 projects will carry out assessment of all the safeguarding principles discussed in the GS4GG Safeguarding Principles and Requirements document.)

Guanbaodu:

Safeguarding principles	Assessment questions	Assessment of relevance to the project (Yes/potentially/no)	Justification	Mitigation measure (if required)
3.1 Human Rights	a. Does the Project respect internationally proclaimed human rights and not complicit in violence or human rights abuses of any kind as defined in the	Yes	a. Yes, the project complies with Chinese Labour Law and relevant regulations while China has ratified two core UN human rights treaties, including the UN International Covenant on Civil and Political Rights	-

	Universal Declaration of Human Rights? b. Does the Project not discriminate with regards to participation and inclusion?		(ICCPR) and the International Covenant on Economic, Social and Cultural Rights (ICESCR)². b. Yes, there was a stakeholder consultation carried out regarding the proposed project. Local people were actively involved in expressing their opinions and comments.	
3.2 Gender Equality and Women's Rights	a. Is there a possibility that the Project might reduce or put at risk women's access to or control of resources, entitlements and benefits? b. Is there a possibility that the Project can adversely affect men and women in marginalised or vulnerable communities (e.g., potential increased burden on women or social isolation of men)? c. Is there a possibility that the Project might not take into account gender roles and the abilities of women or men to participate in the decisions/designs of the project's activities (such as lack of time, child care duties, low literacy or educational levels, or societal discrimination)?	yes	a. No, Chinese Labour Law forbid any form of discriminate based on gender, race, religion, sexual orientation or on any other basis. b. No, the project offered some jobs for local women and men during the construction and operation period. c. No, Chinese Labour Law forbid any form of discriminate based on gender, race, religion, sexual orientation or on any other basis. d. No, Chinese Labour Law forbid any form of discriminate based on gender, race, religion, sexual orientation or on any other basis. e. No, all employees are engaged in the project implementation on a voluntary basis. The project fully respects the employee's rights in accordance with all labour related laws.	-

² <http://hrlibrary.umn.edu/research/ratification-china.html>

	d. Does the Project take into account gender roles and the abilities of women or men to benefit from the Project's activities? e. Does the Project design contribute to an increase in women's workload that adds to their care responsibilities or that prevents them from engaging in other activities? f. Would the Project potentially reproduce or further deepen discrimination against women based on gender, for instance, regarding their full participation in design and implementation or access to opportunities and benefits? g. Would the Project potentially limit women's ability to use, develop and protect natural resources, taking into account different roles and priorities of women and men in accessing and managing environmental goods and services? h. Is there a likelihood that the proposed Project would expose women and		f. No, Chinese Labour Law forbid any form of discriminate based on gender, race, religion, sexual orientation or on any other basis. g. No, Chinese Labour Law forbid any form of discriminate based on gender, race, religion, sexual orientation or on any other basis. h. No, the project will provide safe and healthy working conditions including a health and safety management system. The Labour Protection code is available for the project. It is an industry regulation and is a general code.	
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	girls to further risks or hazards?			
3.3 Community Health, Safety and Working Conditions	Is there a possibility that the Project shall avoid community exposure to increased health risks and shall not adversely affect the health of the workers and the community?	yes	Yes, this project also provided some training opportunities for employees periodically, including technical, management and safety knowledge, and the related employees have to pass the examination to ensure the safety working environment. And the project will provide safe and healthy working conditions including a health and safety management system.	Proper measures are employed to mitigate the potential impacts: 1) Construction sites are equipped with road sprinklers; 2) construction workers wear dust masks; 3) quantity of dynamite and speed of vehicles shall be controlled. The pollution from earthwork blast, drudging and transportation will not have significant impact on atmosphere.
3.4.1 Sites of Cultural and Historical Heritage	Does the Project Area include sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture (e.g., knowledge, innovations, or practices)?	No	No, the Guanbaodu project is located on the lower reach of Qushui river. The project is 16 km from Jingzhou County and the geographical coordinates are east longitude 109°44'09" and north latitude 26°40'38". The sites not included cultural and historical heritage.	-
3.4.2 Forced Eviction and Displacement	Does the Project require or cause the physical or economic relocation of peoples (temporary or permanent, full or partial)?	Yes	Yes, according to EIA of the project, the increased water level in the reservoir may lead to a little more flooded area including 5Mu farmland and 6km-long path.	Based on the investigation and the negotiation, the project owner and the villagers whose lands might be impacted by the project agreed a compensation agreement. The project owner have

				compensated for 2.3 hectares of land which involved 30 households and a total amount of 314 thousand RMB have been paid by the project owner.
3.4.3 Land Tenure and Other Rights	a. Does the Project require any change to land tenure arrangements and/or other rights? b. For Projects involving land-use tenure, are there any uncertainties with regards land tenure, access rights, usage rights or land ownership?	No	a. No, the project is not involved any change to land tenure arrangements. b. No, the project owner and villagers whose lands might be impacted by the project have signed a compensation agreemen for lands might be impacted by the project.	-
3.4.4 Indigenous Peoples	Are indigenous peoples present in or within the area of influence of the Project and/or is the Project located on land/territory claimed by indigenous peoples?	No	No, most of the rural land in China belongs to local village collectives. The project is located in Guanbaodu Village of Jingzhou County, Huaihua City, Hunan Province, so the project land belongs to Guanbaodu Village Collective. Actually, the project was rasied and invested by local villagers living around the project location individually or through the Guanbaodu Village Collective, therefore all the local villagers have became the shareholders of the project who could benefit from the operation of the project..	-
3.5 Corruption	Does the Project involve, be complicit in or inadvertently contribute to or	No	No, the project does not involve and is not complicit in corruption. The project complies with Chinese	-

	reinforce corruption or corrupt Projects?		Labour Law and relevant regulations, does not condone or support corruption.	
3.6.1 Labour Rights	a. Does the project developer ensure there is no forced labour and that all employment is in compliance with national labour and occupational health and safety laws, with obligations under international law, and consistency with the principles and standards embodied in the International Labour Organization fundamental conventions? b. Do workers be able to establish and join labour organisations? c. Does working agreements with all individual workers be documented and implemented?	Yes	a. Yes, all employees are engaged in the project implementation on a voluntary basis. The project fully respects the employee's rights in accordance with all labour related laws. b. Yes, the project activity does not interfere with legal rights regarding employees' freedom of association or their right to collective bargaining. The project fully respects the employee's freedom and rights. c. Yes, the project complies with Chinese Labour Law and relevant regulations. And comprehensive insurance has been provided to every permanent employee.	-
3.6.2 Negative Economic Consequences	a. Could the Project Developer demonstrate the financial sustainability of the Projects implemented, also including those that will occur beyond the Project Certification period? b. Should the Projects consider economic impacts and demonstrate a	Yes	a. Yes, the Guanbaodu project triggers new investment in the rural region. As the project is invested by most of the residents living around, it will not only provide financial return to local residents but also provide direct and indirect employment opportunities, which will lead to economic well-being of local residents.	-

	consideration of potential risks to the local economy and how these have been taken into account in Project design, implementation, operation and after the Project?		b. Yes, there was a stakeholder consultation carried out regarding the proposed project (Stakeholder Consultation Report). Local people were actively involved in expressing their opinions and comments. Therefore, the consultation meeting helps to incorporate local opinions in the development of the project. And the village committee made the investment on behalf of them. When the project operation started, they received their share of the annual profit in return.	
4.1.1 Emissions	Will the Project increase greenhouse gas emissions over the Baseline Scenario?	Yes	No, during the operation period, the electricity generated by the project partially replaces electricity generation from other conventional sources of energy, and the project helps to reduce greenhouse gas (GHG) emissions by an estimated 9,281 tCO ₂ e per year during the first crediting period.	-
4.1.2 Energy Supply	a. Will the Project use energy from a local grid or power supply (i.e., not connected to a national or regional grid) or fuel resource (such as wood, biomass) that provides for other local users?	Yes	No, the project is a hydropower plant who does not use any fuel resource and only involves a little electricity consumption for emergency situation which will be delivered directly from Central China Power Grid (CCPG) and the energy supply for other local users will not be influenced.	-
4.2.1 Impact on natural	a. Will the Project affect the natural or pre-	Yes	No, there is no obvious variation of water quantity	-

water patterns and flow	existing pattern of watercourses, ground-water and/or the watershed(s) such as high seasonal flow variability, flooding potential, lack of aquatic connectivity or water scarcity?		because this project is a run of river hydropower plant with no capacity of conditioning.	
4.2.2 Erosion and/or water body stability	a. Could the Project directly or indirectly cause additional erosion and/or water body instability or disrupt the natural pattern of erosion?	Yes	Yes, but the Water and Soil Conservation Plan is strictly enforced during and after the construction period to mitigate the impact on local environment. According to stakeholder's questionnaires, there are no considerable effects on fish and organism species and habitats due to the project activity for following three reasons: 1) as explained for water quantity, there will be no water reduction area, so the aquatic organisms and fish in the downstream generally will not be disturbed; 2) during the high flow period, the water heads of upper stream and downstream of the proposed project are quite close so that fish and aquatic organisms can swim up and down; 3) The grids installed at the power house entrance can prevent the aquatic organisms and fish from entering the turbines. On the other hand, the amount of some terrestrial animals such as birds, snakes and rats will decrease to some extent due to the	The earthworks are filled in the project site for replanting; rehabilitation of vegetation in the affected places such as construction site and reservoir is conducted right after the completion of the construction work. Walls will be constructed along the shore of the river to keep the soil; an acceptance meeting with governmental agencies has been held to prove that and the project passed the completion check.

			increasing of water level. However, the project site is modified from a pumping station. The dam is heightened from 3.5m to 4.3m, which leads to the a little increasing of reservoir area so that more inlets and discharges will be formed, and then the species of some aquatic organisms, fish, and water-loving birds and frogs will increase.	
4.2.3 Landscape modification and soil	a. Does the Project involve the use of land and soil for production of crops or other products?	No	No, the Project does not involve the use of land and soil for production of crops or other products.	-
4.3.2 Vulnerability to Natural Disaster	Will the Project be susceptible to or lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, flooding, drought or other extreme climatic conditions?	No	No, according to EIA of the project, there is no obvious variation of water quantity because this project is a run of river hydropower plant with no capacity of conditioning. And no significant environmental impact were expected due to the project. In addition, Water and Soil Conservation Plan is strictly enforced during and after the construction period to mitigate the impact on local environment. Therefore the Project will not be susceptible to or lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, flooding, drought or other extreme climatic conditions.	-
4.3.3 Genetic Resources	Could the Project be negatively impacted by	No	The Project not involved the use of genetically modified	-

	the use of genetically modified organisms or GMOs (e.g., contamination, collection and/or harvesting, commercial development)?		organisms or GMOs (e.g., contamination, collection and/or harvesting, commercial development)	
4.3.4 Release of pollutants	Could the Project potentially result in the release of pollutants to the environment?	Yes	Yes, the wastewater in the construction period mainly consists of industrial wastewater and domestic wastewater. The air pollution mainly comes from project construction which has been well controlled.	During the construction period, washing wastewater was treated in sediment tank before discharged to the river; wastewater with oil was treated through filtration; Sanitary sewage was treated in the septic tank by digestion process and reused as fertilizers. During the operational period, oil in the wastewater is absorbed by oil absorption paper and wood residues. The paper and wood residues with oil is burned afterwards to prevent potential pollutions. Sanitary sewage is treated as the same measure used during the construction period (EIA p25). After taking these measures, the impact of waste water on local water

				body will not be significant. The air pollution mainly comes from project construction. Proper measures are employed to mitigate the potential impacts: 1) Construction sites are equipped with road sprinklers; 2) construction workers wear dust masks; 3) quantity of dynamite and speed of vehicles shall be controlled (EIA p25). The pollution from earthwork blast, drudging and transportation will not have significant impact on atmosphere.
4.3.5 Hazardous and Non-hazardous Waste	Will the Project involve the manufacture, trade, release, and/ or use of hazardous and non-hazardous chemicals and/or materials?	No	The Project does not involve the manufacture, trade, release, and/ or use of hazardous and non-hazardous chemicals and/or materials	-
4.3.6 Pesticides and fertilizers	Will the Project involve the application of pesticides and/or fertilisers?	No	The Project does not involve the application of pesticides and/or fertilisers	-
4.3.7 Harvesting of forests	Will the Project involve the harvesting of forests?	No	The Project does not involve the harvesting of forests.	-
4.3.8 Food	Does the Project modify the quantity or nutritional quality of food available such	No	The Project does not involve the negative influence on access to and availability of food for people affected.	-

	as through crop regime alteration or export or economic incentives?			
4.3.9 Animal Husbandry	Will the Project involve animal husbandry?	No	The Project does not involve animal husbandry	-

Liangjiangkou:

Safeguarding principles	Assessment questions	Assessment of relevance to the project (Yes/potentially/no)	Justification	Mitigation measure (if required)
3.1 Human Rights	a. Does the Project respect internationally proclaimed human rights and not complicit in violence or human rights abuses of any kind as defined in the Universal Declaration of Human Rights? b. Does the Project not discriminate with regards to participation and inclusion?	Yes	a. Yes, the project complies with Chinese Labour Law and relevant regulations while China has ratified two core UN human rights treaties, including the UN International Covenant on Civil and Political Rights (ICCPR) and the International Covenant on Economic, Social and Cultural Rights (ICESCR) . b. Yes, there was a stakeholder consultation carried out regarding the proposed project. Local people were actively involved in expressing their opinions and comments.	-
3.2 Gender Equality and Women's Rights	a. Is there a possibility that the Project might reduce or put at risk women's access to or control of resources,	yes	a. No, Chinese Labour Law forbid any form of discriminate based on gender, race, religion, sexual	-

	entitlements and benefits? b. Is there a possibility that the Project can adversely affect men and women in marginalised or vulnerable communities (e.g., potential increased burden on women or social isolation of men)? c. Is there a possibility that the Project might not take into account gender roles and the abilities of women or men to participate in the decisions/designs of the project's activities (such as lack of time, child care duties, low literacy or educational levels, or societal discrimination)? d. Does the Project take into account gender roles and the abilities of women or men to benefit from the Project's activities? e. Does the Project design contribute to an increase in women's workload that adds to their care responsibilities or that prevents them from engaging in other activities? f. Would the Project potentially reproduce or		orientation or on any other basis. b. No, the project offered two part-time job opportunities to females for financing work. Their salary is the same as the male part-time employees. c. No, Chinese Labour Law forbid any form of discriminate based on gender, race, religion, sexual orientation or on any other basis. d. No, Chinese Labour Law forbid any form of discriminate based on gender, race, religion, sexual orientation or on any other basis. e. No, all employees are engaged in the project implementation on a voluntary basis. The project fully respects the employee's rights in accordance with all labour related laws. f. No, Chinese Labour Law forbid any form of discriminate based on gender, race, religion, sexual orientation or on any other basis. g. No, Chinese Labour Law forbid any form of discriminate based on gender, race, religion, sexual orientation or on any other basis. h. No, the project will provide safe and healthy working conditions including a health and safety management system. The Labour	
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	further deepen discrimination against women based on gender, for instance, regarding their full participation in design and implementation or access to opportunities and benefits? g. Would the Project potentially limit women's ability to use, develop and protect natural resources, taking into account different roles and priorities of women and men in accessing and managing environmental goods and services? h. Is there a likelihood that the proposed Project would expose women and girls to further risks or hazards?		Protection code is available for the project. It is an industry regulation and is a general code.	
3.3 Community Health, Safety and Working Conditions	Is there a possibility that the Project shall avoid community exposure to increased health risks and shall not adversely affect the health of the workers and the community?	yes	Yes, this project also provided some training opportunities for employees periodically, including technical, management and safety knowledge, and the related employees have to pass the examination to ensure the safety working environment. And the project will provide safe and healthy working conditions including a health and safety management system.	Proper measures are employed to mitigate the potential impacts: 1) Construction sites are equipped with road sprinklers; 2) construction workers wear dust masks; 3) quantity of dynamite and speed of vehicles shall be controlled. The pollution from earthwork blast, drudging and

				transportation will not have significant impact on atmosphere.
3.4.1 Sites of Cultural and Historical Heritage	Does the Project Area include sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture (e.g., knowledge, innovations, or practices)?	No	No, the Liangjiangkou project is located on the Tongdao River. The project is 8.5 km away from Tongdao County and the geographical coordinates are east longitude 109°47'45" and north latitude 26°13'11". The sites not included cultural and historical heritage.	-
3.4.2 Forced Eviction and Displacement	Does the Project require or cause the physical or economic relocation of peoples (temporary or permanent, full or partial)?	Yes	Yes, according to EIA of the project, the increased water level may lead to a little more flooded area including 30Mu farmland.	To mitigate this impact, before the construction of the Liangjiangkou project, the project owner held three meetings with the villagers from Tumen Village, the villagers raised a lot of requirements to the project owner, such as build new bridges, build new roads, etc. For convenience, the project owner asked help from the government to collect the requirements from the villages and summarized to the project owner. With the help from the government, the project owner and the 21 villagers from Tumen Village

				signed the compensation agreement on 6 June, 2006. The final compensation was 10 times higher than the national compensation standard.
3.4.3 Land Tenure and Other Rights	a. Does the Project require any change to land tenure arrangements and/or other rights? b. For Projects involving land-use tenure, are there any uncertainties with regards land tenure, access rights, usage rights or land ownership?	No	a. No, the project is not involved any change to land tenure arrangements. b. No, the project owner and villagers communicated about the construction of the project and new bridges, new roads. They agreed a compensation agreement for lands might be impacted by the project.	-
3.4.4 Indigenous Peoples	Are indigenous peoples present in or within the area of influence of the Project and/or is the Project located on land/territory claimed by indigenous peoples?	No	No, most of the rural land in China belongs to local village collectives. The project is located in Tumen Village of Tongdao County, Huaihua City, Hunan Province, so the project land belongs to Tumen Village Collective.	-
3.5 Corruption	Does the Project involve, be complicit in or inadvertently contribute to or reinforce corruption or corrupt Projects?	No	No, the project does not involve and is not complicit in corruption. The project complies with Chinese Labour Law and relevant regulations, does not condone or support corruption.	-
3.6.1 Labour Rights	a. Does the project developer ensure there is no forced labour and that all employment is in compliance with	Yes	a. Yes, all employees are engaged in the project implementation on a voluntary basis. The project fully respects the employee's rights in accordance with all labour related laws.	-

	national labour and occupational health and safety laws, with obligations under international law, and consistency with the principles and standards embodied in the International Labour Organization fundamental conventions? b. Do workers be able to establish and join labour organisations? c. Does working agreements with all individual workers be documented and implemented?		b. Yes, the project activity does not interfere with legal rights regarding employees' freedom of association or their right to collective bargaining. The project fully respects the employee's freedom and rights. c. Yes, the project complies with Chinese Labour Law and relevant regulations. And comprehensive insurance has been provided to every permanent employee.	
3.6.2 Negative Economic Consequences	a. Could the Project Developer demonstrate the financial sustainability of the Projects implemented, also including those that will occur beyond the Project Certification period? b. Should the Projects consider economic impacts and demonstrate a consideration of potential risks to the local economy and how these have been taken into account in Project design, implementation, operation and after the Project?	Yes	a. Yes, some employment opportunities during the construction and operation period increase the income of local people. And the project activity also brings other essential services to local community: 1) three bridges have been built; 2) pumping pipelines for local resident have been established; 3) some small docks have been built for daily life. b. Yes, there was a stakeholder consultation carried out regarding the proposed project (Stakeholder Consultation Report). Local people were actively involved in expressing their opinions and comments. Therefore, the	-

			consultation meeting helps to incorporate local opinions in the development of the project.	
4.1.1 Emissions	Will the Project increase greenhouse gas emissions over the Baseline Scenario?	Yes	No, during the operation period, the electricity generated by the project partially replaces electricity generation from other conventional sources of energy, and the project helps to reduce greenhouse gas (GHG) emissions by an estimated 3,649 tCO ₂ e per year during the first crediting period.	-
4.1.2 Energy Supply	a. Will the Project use energy from a local grid or power supply (i.e., not connected to a national or regional grid) or fuel resource (such as wood, biomass) that provides for other local users?	Yes	No, the project is a hydropower plant who does not use any fuel resource and only involves a little electricity consumption for emergency situation which will be delivered directly from Central China Power Grid (CCPG) and the energy supply for other local users will not be influenced.	-
4.2.1 Impact on natural water patterns and flow	a. Will the Project affect the natural or pre-existing pattern of watercourses, ground-water and/or the watershed(s) such as high seasonal flow variability, flooding potential, lack of aquatic connectivity or water scarcity?	Yes	No, there is no obvious variation of water quantity because this project is a run of river hydropower plant with no capacity of conditioning.	-
4.2.2 Erosion and/or water body stability	a. Could the Project directly or indirectly cause additional erosion and/or water body instability or disrupt the	Yes	Yes, but the Water and Soil Conservation Plan is strictly enforced during and after the construction period to mitigate the impact on local environment.	Temporary occupied sites and dredged sites were treated in time and replanting was carried out on the

	natural pattern of erosion?			sites afterwards; retaining walls was set up to prevent the water and soil loss.
4.2.3 Landscape modification and soil	a. Does the Project involve the use of land and soil for production of crops or other products?	No	No, the Project does not involve the use of land and soil for production of crops or other products.	-
4.3.2 Vulnerability to Natural Disaster	Will the Project be susceptible to or lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, flooding, drought or other extreme climatic conditions?	No	No, according to EIA of the project, there is no obvious variation of water quantity because this project is a run of river hydropower plant with no capacity of conditioning. And no significant environmental impact were expected due to the project. In addition, Water and Soil Conservation Plan is strictly enforced during and after the construction period to mitigate the impact on local environment. Therefore the Project will not be susceptible to or lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, flooding, drought or other extreme climatic conditions.	-
4.3.3 Genetic Resources	Could the Project be negatively impacted by the use of genetically modified organisms or GMOs (e.g., contamination, collection and/or harvesting, commercial development)?	No	The Project not involved the use of genetically modified organisms or GMOs (e.g., contamination, collection and/or harvesting, commercial development)	-

4.3.4 Release of pollutants	Could the Project potentially result in the release of pollutants to the environment?	Yes	Yes, wastewater in the construction period mainly consists of industrial wastewater and domestic wastewater. The air pollution mainly comes from project construction which has been well controlled.	During the construction period, washing wastewater was treated in a sediment tank before discharged to the river and then the impact of waste water on local water body was not significant. During the operational period, oil in the wastewater is absorbed by oil absorption paper and wood residues. The paper and wood residues with oil is burned afterwards to prevent potential pollutions. Sanitary sewage is treated in the septic tank by digestion process and reused as fertilizers (EIA p15) The air pollution mainly comes from project construction. Proper measures are employed to mitigate the potential impacts: 1) Construction sites are equipped with road sprinklers; 2) construction workers wear dust masks; 3) quantity of dynamite and
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				speed of vehicles shall be controlled (EIA p10).
4.3.5 Hazardous and Non-hazardous Waste	Will the Project involve the manufacture, trade, release, and/ or use of hazardous and non-hazardous chemicals and/or materials?	No	The Project does not involve the manufacture, trade, release, and/ or use of hazardous and non-hazardous chemicals and/or materials	-
4.3.6 Pesticides and fertilizers	Will the Project involve the application of pesticides and/or fertilisers?	No	The Project does not involve the application of pesticides and/or fertilisers	-
4.3.7 Harvesting of forests	Will the Project involve the harvesting of forests?	No	The Project does not involve the harvesting of forests.	-
4.3.8 Food	Does the Project modify the quantity or nutritional quality of food available such as through crop regime alteration or export or economic incentives?	No	The Project does not involve the negative influence on access to and availability of food for people affected.	-
4.3.9 Animal Husbandry	Will the Project involve animal husbandry?	No	The Project does not involved animal husbandry	-

SECTION C Monitoring plan

C.1 Data and parameters to be monitored

(Include specific information on how the data and parameters that need to be monitored in the selected methodology(ies) or proposed approaches or as per mitigation measures from safeguarding principles assessment or as per feedback from stakeholder consultations would actually be collected during monitoring. Copy this table for each piece of data and parameter.)

Relevant Indicator/Safeguarding Principle	SDG Safeguarding Principles 4.2: Water
Data / Parameter	Water quality
Unit	Level of management
Description	The impact of waste water on local water bodythe operation period
Source of data	Estimated
Value(s) applied	No negative impact
Measurement methods and procedures	The waste water during the operation period can be monitored by stakeholders' questionnaires
Monitoring frequency	Yearly during the operation period

QA/QC procedures	/
Purpose of data	Assessment of Safeguarding Principles
Additional comment	This parameter can be used to demonstrate SDG 13: Climate and action and Safeguarding Principles 4.2: Water.

Relevant Indicator/Safeguarding Principle	SDG Safeguarding Principles 4.3: Environment, ecology and land use
Data / Parameter	Solid wastes
Unit	Level of management
Description	Management of the domestic rubbish during the operation period
Source of data	Measured
Value(s) applied	No negative impacts
Measurement methods and procedures	The influence of solid wastes during the construction period can be monitored by local stakeholder's comments. The domestic rubbish treatment during the operation period can be monitored by relevant management.
Monitoring frequency	Yearly during operation period
QA/QC procedures	/
Purpose of data	Assessment of Safeguarding Principles
Additional comment	This parameter can be used to demonstrate SDG 13: Climate and action and Safeguarding Principles 4.3: Environment, ecology and land use.

Relevant Indicator/Safeguarding Principle	SDG Safeguarding Principles 4.3: Environment, ecology and land use
Data / Parameter	Biodiversity (species and habitat conservation)
Unit	Degree of Biodiversity
Description	The impacts of project activity on fish and organism species and habitats
Source of data	Estimated
Value(s) applied	No negative impacts
Measurement methods and procedures	This parameter can be monitored by stakeholder's questionnaires.
Monitoring frequency	Yearly during operation period
QA/QC procedures	According to EIA, there will be no considerable effects on fish and organism species and habitats due to the project activity and no extinction of any animals will happen. The outcome of Report for the Examination and Acceptance of Completed Project has also concluded that the measures of ecological conservation have been well implemented.
Purpose of data	Assessment of Safeguarding Principles
Additional comment	This parameter can be used to demonstrate Safeguarding Principles 4.3: Environment, ecology and land use.

Relevant Indicator/Safeguarding Principle	SDG SDG Indicator 5.1.1: Whether or not legal frameworks are in place to promote, enforce and monitor equality and non-discrimination on the basis of sex
Data / Parameter	Women employees

Unit	Number
Description	The job positions for local women provided by the project.
Source of data	Measured
Value(s) applied	2 (Guanbaodu) 2 (Liangjiangkou)
Measurement methods and procedures	The monthly payroll contains the information about employees' name, gender and salary. Number of women employees are to be check.
Monitoring frequency	Monthly
QA/QC procedures	/
Purpose of data	Assessment SDG target
Additional comment	/

Relevant SDG Indicator/Safeguarding Principle	SDG Indicator 7.2.1: Renewable energy share in the total final energy consumption
Data / Parameter	Renewable power generation (Access to energy service)
Unit	MWh/y
Description	The amount of electricity the power plant supplies to the local which could release the local power shortage to a certain extent
Source of data	Measured
Value(s) applied	15,513 (Guanbaodu) 6,099 (Liangjiangkou)
Measurement methods and procedures	The monthly power sales receipt received from the local grid company can be checked monthly.
Monitoring frequency	monthly
QA/QC procedures	/
Purpose of data	Assessment of SDG target
Additional comment	/

Relevant SDG Indicator/Safeguarding Principle	SDG Indicator 8.3.1: Proportion of informal employment in non-agriculture employment, by sex
Data / Parameter	Training opportunities (human and institutional capacity)
Unit	/
Description	Technical training provided by the project
Source of data	Measured
Value(s) applied	/
Measurement methods and procedures	The training records and relevant technical certificates of the employees are to be check.
Monitoring frequency	Monthly
QA/QC procedures	/
Purpose of data	Assessment of SDG target
Additional comment	/

Relevant Indicator/Safeguarding Principle	SDG SDG Indicator 8.3.1: Proportion of informal employment in non-agriculture employment, by sex
Data / Parameter	Employment (including job quality, fulfillment of labor standards)
Unit	Number
Description	The numbers of employees of permanent jobs provided by the project
Source of data	Measured
Value(s) applied	16 (Guanbaodu) 7 (Liangjiangkou)
Measurement methods and procedures	The monthly payroll are to be check.
Monitoring frequency	Monthly
QA/QC procedures	/
Purpose of data	Assessment of SDG target
Additional comment	/

Relevant Indicator/Safeguarding Principle	SDG SDG Indicator 8.5.1: Average hourly earnings of female and male employees, by occupation, age and persons with disabilities
Data / Parameter	Salary level (livelihood of the poor)
Unit	RMB
Description	Salary of employees of the project
Source of data	Measured
Value(s) applied	/
Measurement methods and procedures	The monthly payroll are to be check.
Monitoring frequency	Monthly
QA/QC procedures	/
Purpose of data	Assessment of SDG target
Additional comment	/

Relevant Indicator/Safeguarding Principle	SDG SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data / Parameter	Electricity export (EG _{export})
Unit	MWh/y
Description	Electricity delivered to the power grid generated by the project
Source of data	Measured
Value(s) applied	15,513 (Guanbaodu) 6,099 (Liangjiangkou)
Measurement methods and procedures	Electricity monitored by meter records
Monitoring frequency	Continuous measurement and monthly recording
QA/QC procedures	Meter readings will be cross checked by Electricity Transaction Notes (ETN).
Purpose of data	Assessment of SDG target

Additional comment	/
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Relevant Indicator/Safeguarding Principle	SDG SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data / Parameter	Electricity import (EG _{import})
Unit	MWh
Description	Electricity imported from the power grid by the project
Source of data	Measured
Value(s) applied	0
Measurement methods and procedures	Electricity monitored by meter records
Monitoring frequency	Continuous measurement and monthly recording
QA/QC procedures	Meter readings will be cross checked by Electricity Transaction Notes (ETN).
Purpose of data	Assessment of SDG target
Additional comment	/

Relevant Indicator/Safeguarding Principle	SDG SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data / Parameter	Net Electricity supplied to the grid by the project (EG _{PJ,y})
Unit	MWh
Description	Net Electricity supplied to the grid by the project
Source of data	Calculated
Value(s) applied	15,513 (Guanbaodu) 6,099 (Liangjiangkou)
Measurement methods and procedures	Electricity monitored by meter records
Monitoring frequency	Continuous measurement and monthly recording
QA/QC procedures	Meter readings will be cross checked by Electricity Transaction Notes (ETN).
Purpose of data	Assessment of SDG target
Additional comment	/

Relevant Indicator/Safeguarding Principle	SDG SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data / Parameter	Installed capacity
Unit	MW
Description	Installed capacity of project
Source of data	Measured

Value(s) applied	4 (Guanbaodu) 1.8g (Liangjiangkou)
Measurement methods and procedures	Readings of nameplate
Monitoring frequency	Yearly
QA/QC procedures	The installed capacity will be checked the nameplates of all the generators installed in the project.
Purpose of data	Assessment of SDG target
Additional comment	/

Relevant SDG Indicator/Safeguarding Principle	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data / Parameter	Area of the reservoir
Unit	m ²
Description	Area of the reservoir
Source of data	Measured
Value(s) applied	328,000 (Guanbaodu) 177,700 (Liangjiangkou)
Measurement methods and procedures	The third party's report
Monitoring frequency	Yearly
QA/QC procedures	The area of the reservoir is measured by local River Management Station
Purpose of data	Assessment of SDG target
Additional comment	/

Relevant SDG Indicator/Safeguarding Principle	SDG Indicator 13.3.2: Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions
Data / Parameter	Power density
Unit	W/m ²
Description	Power density of project
Source of data	Calculated
Value(s) applied	12.20 (Guanbaodu) 10.64 (Liangjiangkou)
Measurement methods and procedures	/
Monitoring frequency	Yearly
QA/QC procedures	The results during the whole verification period are higher than 10W/m ² , therefore, no project emission needs to be taken into account.
Purpose of data	Assessment of SDG target
Additional comment	/

C.1.1 Other elements of monitoring plan (if applicable)

>>

Not applicable

SECTION D Duration and crediting period

D.1 Duration of project

D.1.1 Start date of project

>> *(Specify start date of the project, in the format of DD/MM/YYYY)*

Guanbaodu: 08/08/2005 (Signature of equipment purchase contract)

Liangjiangkou: 02/08/2006 (Signature of construction contract)

D.1.2 Expected operational lifetime of project

>> *(Specify in years)*

20 years

D.2 GS Crediting period of the project/activity

Renewable crediting period of 3*7 years

D.2.1 Start date of the ongoing GS crediting period

>> *(Specify in dd/mm/yyyy)*

01/01/2016 (start date of the second renewable crediting period)

D.2.2 End date of the ongoing GS crediting period

>> *(Specify in dd/mm/yyyy)*

31/12/2022 (end date of the second renewable crediting period)

D.2.3 Total length of the GS crediting periods

>> *(Specify the total length of crediting period in years in line with GS4GG Principles & Requirements or relevant activity requirements)*

21 years

SECTION E Stacking of new assets

>> *(If project is looking to stack new assets over GSVERs the required information to demonstrate compliance to the relevant methodology, product specification and additionality shall be presented in the new PDD template launched with GS4GG)*

Not applicable.

Appendix 1. Contact information of project participants

Organization name	Jingzhou Miao & Dong Autonomous County Guanbaodu Hydropower Co., Ltd
Registration number with relevant authority	91431229780854727A
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State/Region	Hunan Province
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Country	People's Republic of China
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E-mail	/
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Contact person	Li Yonghua
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Personal e-mail	/

Organization name	Tongdao Dong Autonomous County Liangjiangkou Hydropower Station
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