



**PROJECT DESIGN DOCUMENT FORM
FOR CDM PROJECT ACTIVITIES (F-CDM-PDD)
Version 04.1**

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Gansu Ganzhou District Nantan Phase I 50MWp Solar Photovoltaic Power Project
Version number of the PDD	Version 02
Completion date of the PDD	21/05/2013
Project participant(s)	Project owner: Gansu Heihe Hydropower New Energy Development Co., Ltd. China's DNA: Department of Climate Change, National Development and Reform Commission
Host Party(ies)	People's Republic of China
Sectoral scope and selected methodology(ies)	Sectoral Scope 1: Energy industries (renewable-/non-renewable sources) Methodology: ACM0002 (Version 13.0.0)
Estimated amount of annual average GHG emission reductions	67,177 tCO ₂ e (for the first 7-year crediting period)

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The Gansu Ganzhou District Nantan Phase I 50MWp Solar Photovoltaic Power Project (hereinafter referred to as “the Project”), developed by Gansu Heihe Hydropower New Energy Development Co., Ltd., involves the installation and operation of a grid-connected power plant that generates electricity using photovoltaic solar technology. The Project is located in the southern area of Ganzhou District, Zhangye city, Gansu province, P. R. China.

The Project utilizes solar energy to generate electricity with a total installed capacity of 50 MWp¹, and is expected to deliver an average of 71,125 MWh to the Northwest China Power Grid (NWCPG) annually during the whole lifetime. The electricity generated by the Project will displace the equivalent amount of electricity supplied by power plants connected to NWCPG which is dominated by fossil fuel-fired power plants. During the first crediting period, the estimated average annual GHG emission reduction is 67,177 tCO₂e and the total emission reduction is 470,242 tCO₂e. The baseline scenario is the same as the scenario existing prior to the implementation of the project activity.

As a renewable solar power project, the Project will contribute to the region’s sustainable development through the following ways:

- Creating short-term and long-term job opportunities in the project area during the project construction and operation;
- Displacing part of the electricity generated by coal-fired or other fossil fuel-fired power plants, and thus improving the local environment and reducing greenhouse gas (GHG) emissions.
- Promoting large-scale utilization of photovoltaic power.

A.2. Location of project activity

A.2.1. Host Party(ies)

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People’s Republic of China

A.2.2. Region/State/Province etc.

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Gansu Province

A.2.3. City/Town/Community etc.

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Ganzhou District, Zhangye City

A.2.4. Physical/Geographical location

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The Project is located in the southern area of Ganzhou District Zhangye city, Gansu province, P.R.China. The geographical coordinate range of the Project are 100°11'42.58"~100°13'48.48" east longitude and 38°50'11"~38°51'00" north latitude. Figure A2-1 and A2-2 show the location of Gansu province in China and the Project in Gansu respectively.

¹ As per actual solar PV contract, the installed capacity of the proposed project is 50.225MWp, for simplification, 50MWp is applied in the PDD.

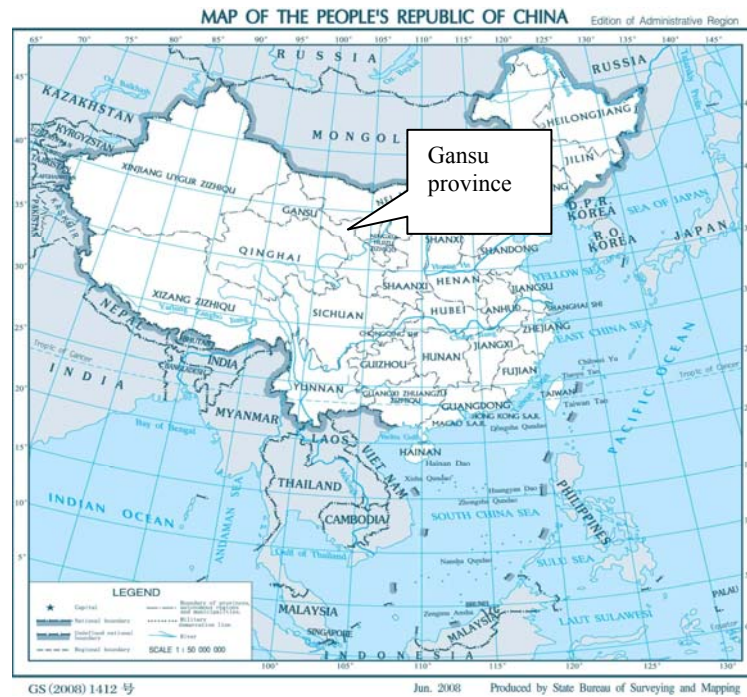


Figure A2-1 Location of Gansu Province in China

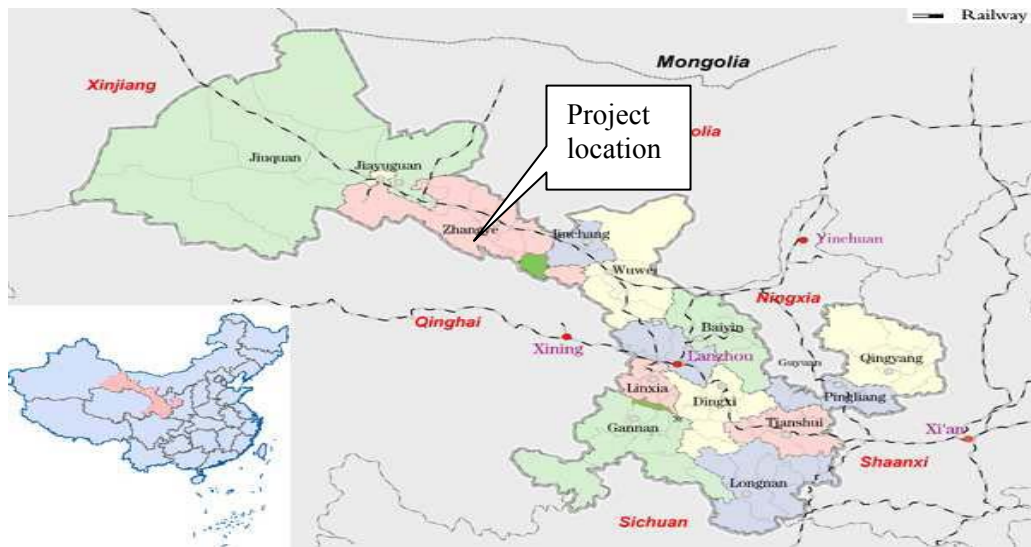


Figure A2-2 Location of the Project in Gansu Province

A.3. Technologies and/or measures

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The proposed project generates electricity from solar energy using photovoltaic technology. The key components of the proposed project consist of polycrystalline silicon modules (70,000 sets with each rated power of 290W and 105,000 sets with each rated power of 285W), DC/AC (Direct Current/Alternating Current) inverters (each with rated power of 500kW) and box-type transformers (with transmission voltage of 35kV). The DC electricity is transformed to AC power by inverters and then boosted up to 35kV by box-type transformers, merged and transformed to 110kV by the onsite main transformer and then delivered to the Heihe 110kV substation and finally to NWCPG.

The main technical parameters of the proposed project are shown in Table A-1.

Table A-1. Main technical parameters of the Project ²

Equipment	Parameters	Unit	Value	Module	Quantity
Solar Modules	Rated power	Wp	290	JKM- 290P-72	70,000
	Operating voltage	V	36.4		
	Operating current	A	7.97		
	Lifetime	year	25		
	Rated power	Wp	285	JKM285P-72	105,000
	Operating voltage	V	36		
	Operating current	A	7.92		
	Lifetime	year	25		
Inverter	Rated power	kW	500	SG500KTL	80
	AC voltage	V	270		
	DC current	A	1,176		
	Lifetime	year	25		
	Rated power	kW	500	EHE-N500KTL	20
	AC voltage	V	270		
	DC current	A	1,070		
	Lifetime	year	25		

It is demonstrated by the design institute that the annual average operating hours of the proposed project is 1,422 hours, correspondingly the plant load factor (PLF) is 16.23%, and the operational lifetime of the project is 25 years.

Both solar modules and inverters used in the proposed project are all produced domestically without relying on technology transfer from abroad.

Prior to the implementation of the project activity, the equivalent amount of electricity was provided by NWCPG (dominated by fossil fuel-fired power plants), which is the same as the baseline scenario (described in B.4).

A.4. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (host)	Gansu Heihe Hydropower New Energy Development Co., Ltd.	Yes

² Sourced from the Technical agreement of the Solar Modules and Inverter



A.5. Public funding of project activity

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No public funding from Annex I Parties is involved in this project activity.

SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

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Title of the approved baseline and monitoring methodology:

- ACM0002 – *Consolidated baseline methodology for grid-connected electricity generation from renewable sources (Version 13.0.0)*.

Title of Methodological Tool :

- *Tool for the demonstration and assessment of additionality (Version 07.0.0)*
- *Tool to calculate the emission factor for an electricity system (Version 03.0.0)*

For more information regarding the methodology, please refer to the following website:

<http://cdm.unfccc.int/methodologies/PAmethodologies/approved>

B.2. Applicability of methodology

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The methodology ACM0002 (Version 13.0.0) is applicable to the Project as the project meets all the applicability criteria as follows:

- The project activity is the installation of a new grid-connected photovoltaic power plant;
- The project does not involve switching from fossil-fuels to renewable energy sources at the site of the project activity;
- The geographic and system boundaries for the electricity grid (NWCPG) can be clearly identified, and information on the characteristics of the grid is available.
- The Project is not a biomass-fired power project.

B.3. Project boundary

The spatial extent of the project boundary includes the Project and all power plants physically connected to NWCPG, to which the Project is connected. The electricity generated by the Project will be delivered to NWCPG, so the project boundary of the Project is represented by NWCPG, which includes integral parts of the Shaanxi Grid, the Gansu Grid, the Qinghai Grid, the Ningxia Grid and the Xinjiang Grid.³ The NWCPG is clearly defined within its spatial and geographical extent. All the power plants within NWCPG can be dispatched by the grid operator without significant transmission constraints. Furthermore, according to the “Explain of confirming baseline emission factors of regional power grid in China” issued by China’s DNA, the NWCPG is defined to be a regional grid in China for the purpose of calculating the build margin (BM) and operating margin (OM).⁴ Therefore, the NWCPG is considered as the project boundary of the project for determining the BM and OM emission factors. There is no electricity imported to NWCPG, so there is no connected electricity system for the project.

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in Table B-1.

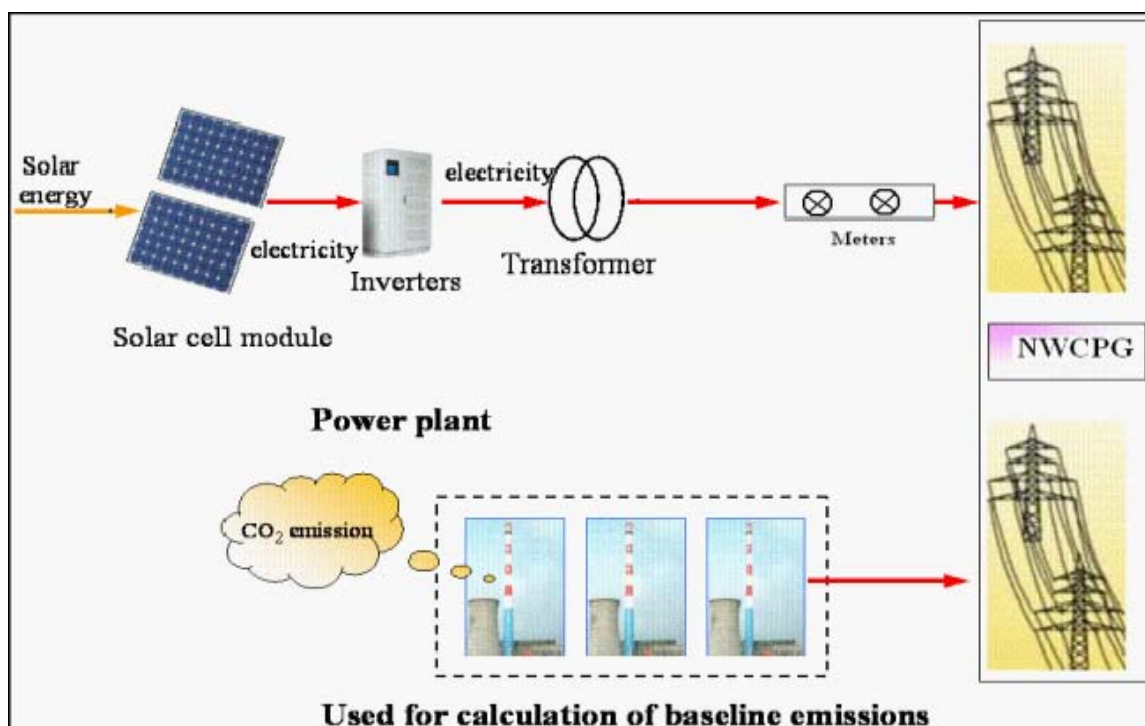
³ <http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2975.pdf>

⁴ http://qhs.ndrc.gov.cn/qj/zjz/t20090703_289357.htm

Table B-1. Emissions sources included in or excluded from the project boundary

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	CO ₂ emissions from electricity generation in fossil fuel fired power plants that are displaced by the project activity.	CO ₂	Yes	Main emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
Project scenario	CO ₂ emissions of the proposed project	CO ₂	No	According to ACM0002, the project emission of solar power generation project activity is 0.
		CH ₄	No	
		N ₂ O	No	

Below is the flow diagram of the project boundary:


Figure B-1. Boundary of the proposed project

B.4. Establishment and description of baseline scenario

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As the proposed project activity includes the installation of a new grid-connected solar power plant, the baseline scenario of the proposed project, as demonstrated in section B.5., is that electricity delivered to the grid by the project activity would otherwise be generated by the operation of grid-connected power plants and by the addition of new generation source.

In accordance with ACM0002, baseline emissions are equal to power generated by the project activity delivered to the Gansu Grid, which is a part of the NWCPG, multiplied by the baseline emission factor. The baseline emission factor ($EF_{grid,CM,y}$) is consisting of the weighted average of the Operating Margin (OM) emission factor and Build Margin (BM) emission factor by utilizing an ex-ante 3 years data vintage for the NWCPG. The detailed calculation for emission reductions are specified in B.6 and Appendix 4.

The key parameters used for calculating the baseline emissions of the project are listed in Table B-2:

Table B-2 Key parameters for calculation

Parameter	Value	Data Source
The operating margin ($EF_{grid,OM,y}$)	0.9913 tCO ₂ e/MWh	NDRC (China's DNA)
The build margin ($EF_{grid,BM,y}$)	0.5398 tCO ₂ e/MWh	NDRC (China's DNA)
The emission factor ($EF_{grid,CM,y}$)	0.8784 tCO ₂ e/MWh	Calculated according to <i>Tool to calculate the emission factor for an electricity system (Version 03.0.0)</i>

B.5. Demonstration of additionality

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CDM consideration

The Feasibility Study Report (FSR) of the project was completed by Shaanxi Province Institute of Water Resource and Electric Power Investigation and Design in 03/2012. The Economic Evaluation in the FSR reveals that the project IRR of the project is 6.83%, which is lower than the 8% benchmark (project IRR, after tax). The FSR design institute advised the project owner to apply for CDM revenue to improve the financial indicators. On 11/04/2012, the board of the Gansu Heihe Hydropower New Energy Development Co., Ltd. decided to develop the project as a CDM project to overcome the financial barriers it faced. The CDM consulting contract was signed with S.D.F (Beijing) Consulting Co., Ltd. on 28/04/2012. The PV Module Purchase Contract was signed on 08/05/2012, which is the earliest real action of the project and therefore is deemed to be the starting date. The stakeholder consultation meeting of the proposed CDM project was held on 15/08/2012 to 16/08/2012. Prior CDM consideration notification was confirmed by the UNFCCC secretariat and the Chinese DNA on 18/10/2012 and 25/10/2012 respectively. The letter of approval was issued on 26/03/2013 by Chinese DNA.

In conclusion, CDM was seriously considered by the project owner prior to the start of the project activity. Some key events related to CDM consideration were listed in the table below:

Table B-3. Timeline of project implementation and CDM consideration

Date	CDM Development Event	Project Implementation Event
03/2012		The Feasibility Study Report was finalized by Shanxi Province Institute of Water Resource and Electric Power Investigation and Design
11/04/2012	Board resolution was made on investing and implementing the project as a CDM project.	
28/04/2012	CDM consulting contract signed with S.D.F (Beijing) Consulting Co., Ltd.	
05/2012		The EIA was finalized by Gansu Environment and Science Design Institute
08/05/2012		The PV Module purchase contract signature (starting date of the project)

06/06/2012		The EIA was approved by the Gansu Environmental Protection Bureau.
15/08/2012-16/08/2012	Stakeholder CDM consultation.	
22/08//2012		The Feasibility Study Report was approved by the Gansu Development and Reform Commission.
18/10/2012	The form of prior consideration of the CDM was sent and meanwhile confirmed by UNFCCC secretariat	
18/10/2012	Prior CDM consideration notification was sent to Chinese DNA	
25/10/2012	Prior CDM consideration notification was confirmed by Chinese DNA	
20/12/2012		The commercial operation date of the project.
26/03/2013	Letter of Approval issued by Chinese DNA	

The project uses the *Tool for the demonstration and assessment of additionality* to demonstrate its additionality. The following steps are taken according to the tool:

Step 0. Demonstration whether the proposed project activity is the first-of-its-kind

The proposed project is not the first-of-its-kind.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Since the approved methodology selected by the project, ACM0002, prescribes the baseline scenario and no further analysis is required, the credible and realistic alternatives are not needed to be identified in the PDD. Only the project scenario without CDM status and the scenario prior to the implementation of the project activity will be considered.

Step 2. Investment analysis

Determine whether the proposed project activity is not:

- a) The most economically or financially attractive; or
- b) Economically or financially feasible without the revenue from the sales of certified emission reductions (CERs)

To conduct the investment analysis, we use the following sub-steps:

Sub-step 2a. Determine appropriate analysis method

Tool for the demonstration and assessment of additionality (Version 07.0.0) recommends three analysis methods, including the simple cost analysis (Option I), the investment comparison analysis (Option II), and the benchmark analysis (Option III).

Apart from CDM income, the proposed project generates financial and economic benefits through the sales of electricity; therefore, the simple cost analysis (Option I) is not applicable. The investment comparison analysis (Option II) is only applicable to projects where alternatives should be similar investment projects. The alternative baseline scenario of the proposed project is the NWCPG providing the equivalent electricity rather than a new investment project. Out of the investment comparison analysis (Option II) and the benchmark analysis (Option III), the benchmark analysis (Option III) is chosen.

Sub-step 2b . – Option III. Apply benchmark analysis

According to the *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*,⁵ the investment benchmark of Project IRR (after tax) in the electric power industry is 8%. The project can only be financially feasible if the project IRR reaches the benchmark. This benchmark of 8% is widely used in the assessment and approval of electricity power projects in China; therefore, it is applied in this analysis to determine whether the proposed project is financially feasible.

Sub-step 2c. Calculation and comparison of financial indicators

The values of the parameters to calculate the project IRR are presented in Table B-4 below:

Table B-4. Basic parameters for financial evaluation

Parameter	Unit	Value	Source
Installed capacity	MWp	50	FSR
Annual average electricity generation during the whole lifetime	MWh	71,125	FSR
Total static investment	CNY	620,668,600	FSR
Electricity tariff (VAT Inc.)	CNY/KWh	1.00	FSR
Interest rate for long-term loan	%	7.05	FSR
Interest rate for working capital loan	%	6.56	FSR
Annual average O&M costs	CNY	9,159,965	FSR
Inc. Staff salary and welfare	CNY	1,800,000	FSR
Insurance expense	CNY	1,410,517	FSR
Material expense	CNY	750,000	FSR
Miscellaneous expense	CNY	1,250,000	FSR
Maintenance expense	CNY	3,949,448	FSR
Depreciation period	year	20	FSR
Residue asset rate	%	5	FSR
Value added tax (VAT)	%	17 ⁶	FSR
City construction tax rate	%	5	FSR
Additional education fee rate	%	5	FSR
Income tax	%	25	FSR
The expected price of CERs	€ /tCO ₂ e	10	Assumed market price
Project operational lifetime	year	25	FSR

Table B-4 shows the project IRR of the project without and with CERs revenue from CDM.

⁵ Published by the Operation Department of Power Generation and Transmission under the State Power Corporation of China on 10/09/2002

⁶ Based on Caishui [2008] No. 170#, the VAT of equipment can be deducted.

Table B-5. IRR comparison without/with CERs

Item	Without CERs	Benchmark	With CERs
Project IRR(after tax)	6.83%	8%	7.72%

It is reflected that the project IRR without CER revenues is 6.83%, which is below the benchmark 8%, thus not financially feasible. The financial status would be greatly improved if the project is registered as a CDM project.

Sub-step 2d. Sensitivity analysis

The sensitivity analysis is used to show whether the conclusion regarding the project's financial attractiveness is reliable under reasonable variations in the critical assumptions. The investment analysis provides a valid argument in favour of additionality only if it consistently supports (within a realistic fluctuation range of the key assumptions) the conclusion that the project activity is unlikely to be financially/economically attractive.

According to the latest EB Guidelines on the Assessment of Investment Analysis (Version 05), only variables that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation. For the project, the most important parameters impacting the IRR include:

- Total static investment;
- Annual electricity delivered to the grid;
- Annual O&M cost;
- Feed-in tariff

The outcomes of the project IRR sensitivity analysis are presented in Table B-6, and Figure B-3.

Table B-6. Sensitivity analysis

	90%	95%	100%	105%	110%	Critical value
Total static investment	7.96%	7.37%	6.83%	6.33%	5.86%	-10.34%
Annual electricity delivered to the grid	5.69%	6.27%	6.83%	7.37%	7.91%	10.81%
Annual O & M cost	6.99%	6.91%	6.83%	6.74%	6.66%	-73.7%
On-grid tariff	5.69%	6.27%	6.83%	7.37%	7.91%	10.81%

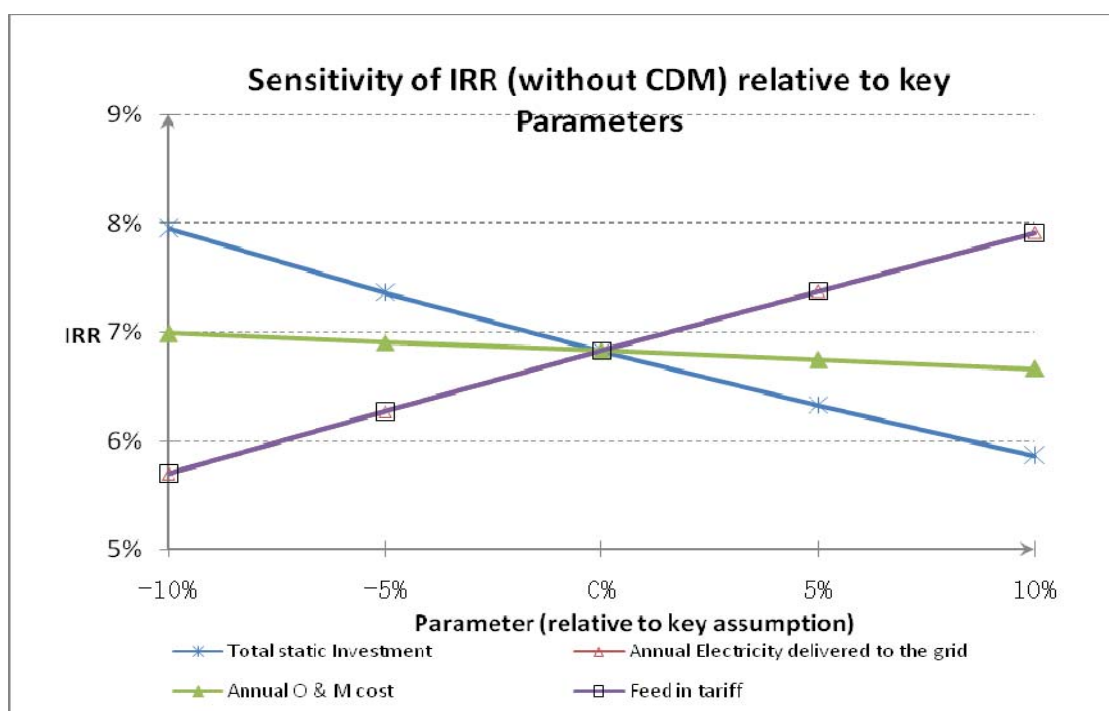


Figure B-3. Sensitivity analysis

As reflected in Figure B-3, the IRR is mainly impacted by total static investment, annual electricity delivered to the grid, and feed-in tariff. The impact of annual O&M cost on the IRR is less significant. Table B-6 also shows that without CER revenues, the project IRR could reach the benchmark of 8% if the total static investment was decreased by 10.34% or if either the feed-in tariff or annual electricity delivered to the grid was increased by 10.81% or the annual O&M cost was decreased by 73.7%.

The detailed analysis on the variation of each parameter is demonstrated in the following:

Total static investment

The project IRR can only reach the benchmark if the total static investment is decreased by 10.34%. For solar PV power projects, the costs of solar cell modules, inverter and transformers comprise the main budget of static investment. The actual contract value for the static investment has already been 619.86 million RMB, which is very close to the budget of 620.67 million RMB in the FSR. Therefore, the total static investment cost of this project is extremely unlikely to decrease by 10.34%.

Annual electricity delivered to the grid

The project IRR of the project can reach the benchmark only if the annual electricity delivered to the grid increased by 10.81%. However such a rise is unlikely to happen, because the data is based on the historical data from 1993~2008 provided by Jiuquan meteorological station and is further analyzed by design institute with popular software PETSreen for annual output calculation. Therefore, the 10.81% increase of electricity delivered to the grid is unlikely to occur.

Annual O&M Cost

As shown in Figure B-3, O&M cost has little impact on the project's IRR. The level of O&M costs is mainly determined by the employee expenditure, maintenance and repair rate, material costs, and other costs. It is very unlikely for the annual O&M cost being decreased by 73.7%.

Feed-in tariff

The tariff would need to increase by 10.81%, to 1.108CNY/kWh, for the proposed project IRR to reach the benchmark. However, this scenario is highly unlikely as well. In China, the electricity tariff of solar

PV power projects is regulated by the central and local government. According to Fagaijiage [2011] No.1594, the project is regulated as approved after 1st Jul. 2011, where the relevant tariff is 1.00CNY/kWh, which is applied in FSR of the project. The tariff of 1.00CNY/kWh has been approved by Gansu DRC on 27/09/2012 and is confirmed in the Power Purchase Agreement signed with the grid company in Nov.2012. Therefore, the 10.81% increase on tariff is unlikely.

Step 3: Barrier analysis

Not applicable

Step 4: Common practice analysis

The common practice analysis of the proposed project is demonstrated as per the Guidelines on Common Practice (Version 02.0).

Sub-step 1: calculate applicable capacity or output range as +/- 50% of the total design capacity or output of the proposed project activity.

The installed capacity of the project is 50 MWp, so the $\pm 50\%$ range is 25~75MWp.

Sub-step 2: identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:

Conditions	Similar projects definition N_{similar}
(a) The projects are located in the applicable geographical area;	Gansu Province is selected as the applicable geographical area for the common practice, for the following reasons: • The unique geological conditions in the Region results in the different solar resources, compared to solar plants in other provinces connected to NWCPG; • The investment environment of each province in China is different. This is due to a number of factors including the economic development level, the industrial structure, and the fundamental infrastructure of the province, the development strategy and the policy framework. These can all affect the final investment decision; • Finally, a number of other key economic factors vary from province to province, including the cost of materials, and other utilities such as water, the cost of labor and services and the types of loan that can be obtained. These all vary between provinces. Solar power projects within the same province are therefore selected for the common practice analysis.
(b) The projects apply the same measure as the proposed project activity;	Power generation based on renewable energy
(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;	Power generation by solar

(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;	Power (electricity) generation
(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;	Capacity between 25MWp~75MWp
(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.	Commercial operation started before 08/05/2012

Therefore, the similar projects of the proposed project are identified as those solar power generation projects, which are located in Gansu Province, with capacity from 25MWp~75MWp, and started commercial operation before 08/05/2012.

Sub-step 3: within the projects identified in step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all} :

Based on public information from Gansu Province Development & Reform Commission Website⁷, CDM in China Website⁸ and UNFCCC CDM Website⁹, all the solar power project in Gansu province has been or being developed as CDM project.

Therefore, $N_{all}=0$.

Sun-Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}

Since $N_{all}=0$, obviously $N_{diff}=0$.

Sun-Step 5: calculate factor $F=1- N_{diff} / N_{all}$ representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

As the analysis above, $N_{all}= N_{diff}= 0$

As per the Tool, only when the factor F is greater than 0.2 and $N_{all}-N_{diff}$ is greater than 3, a project is considered to be a “common practice”. Therefore, it is concluded that the proposed project is not a common practice.

B.6. Emission reductions

⁷ <http://www.gspc.gov.cn/xxgk/Index.asp?page=1>

This website was built and management by Gansu Provincial Development & Reform Commission. All construction projects in Gansu province can be found in this website.

⁸ <http://cdm.ccchina.gov.cn/>

This website was built and management by NDRC in China. All projects applying the CDM can be found in this website.

⁹ <http://cdm.unfccc.int/>

B.6.1. Explanation of methodological choices

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Project Emissions (PE_y)

According to ACM0002, there are no expected project emissions for a solar power generation project.

Therefore, $PE_y = 0$.

Baseline Emissions (BE_y)

As a greenfield solar power plant, the baseline scenario is electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources. The baseline emissions are calculated as the electricity supplied by the project activity to the grid ($EG_{facility,y}$ in MWh) times the combined margin emission factor ($EF_{grid,CM,y}$ in tCO₂/MWh) as follows:

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

Where:

- BE_y = Baseline emission in year y (tCO₂/MWh)
- $EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)
- $EF_{grid,CM,y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”(tCO₂/MWh)

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

The electricity generated by the project activity will be delivered to the NWCPG. In this case, the emission factor of the NWCPG is calculated according to the *Tool for calculation of emission factor for an electricity system (version 03.0.0)*. Data from the China Electric Power Yearbook and China Energy Statistical Yearbook are publicly available to calculate the Emission Factor of the NWCPG. The default values for the calculation of calorific values for fuel types came from the China Energy Statistical Yearbook, and the potential emission factor and fuel oxidation came from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Moreover, the Chinese DNA publishes the emission factor of the NWCPG on its website¹⁰, which is also publicly available.

Step 1: Identify the relevant electricity systems

According to the delineation of the project electricity system and connected electricity systems published by China’s DNA, the project electricity system for the proposed project is Northwest China Power Grid which covers the provincial grids of the Shaanxi Grid, the Gansu Grid, the Qinghai Grid, the Ningxia Grid and the Xinjiang Grid.

The Option b) is selected among the following options to determine the OM for net electricity imported:

- a) 0 tCO₂/MWh; or
- b) The simple operating margin emission rate of the exporting grid, determined as described in step 4 section 6.4.1, if the conditions for this method, as described in step 3 below, apply to the exporting grid; or
- c) The simple adjusted operating margin emission rate of the exporting grid, determined as described in

¹⁰<http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2975.pdf>

step 4 section 6.4.2 below; or

d) The weighted average operating margin (*OM*) emission rate of the exporting grid, determined as described in step 4 section 6.4.4 below.

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

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

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

Based on China's real situation, data of off-grid power plant are unavailable, therefore Option I is selected and only grid power plants are included in the calculation.

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

The calculation of operating margin emission factor ($EF_{grid,OM,y}$) can be based on one of four options listed as follows:

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

In China, specific data from the grid or each power plant is treated as business confidential and thus not public available. Therefore, Option (b) and Option (c) cannot be possibly used for the proposed project. For the most recent 5 years (2006-2010), the low-cost/must run resources constituted less than 50% of total power generation of NWCPG (refer to Appendix 4 for details), which complies with the defined condition of Option (a), but not Option (d). Based on these reasons, **Option (a)** is selected to calculate the Operating Margin emission factor of the proposed project.

The Simple *OM* emission factor can be calculated using either of the two following data vintages for year(s) *y*:

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

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

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 simple *OM* may 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.

Option B can only be used if:

- (a) The necessary data for option A is not available; and
- (b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
- (c) Off-grid power plants are not included in the calculation.

As the data required by option A is not available in China, and the nuclear and renewable power generation are considered as low-cost/must run power sources and the quantity of electricity supplied to the grid by these sources is known in china, and off-grid power plants are not included in the calculation. Therefore, Option B is used for calculating project OM as follows:

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

Where:

$EF_{grid,OMsimple,y}$	=	Simple operating margin CO ₂ emission factor in year y (tCO ₂ /MWh)
$FC_{i,y}$	=	Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)
$EF_{CO_2,i,y}$	=	CO ₂ emission factor of fossil fuel type i in year y (tCO ₂ /GJ)
EG_y	=	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year y (MWh)
i	=	All fossil fuel types combusted in power sources in the project electricity system in year y
y	=	The relevant year as per the data vintage chose in Step 3

Based on the most recent three years (2008-2010) where the data are the latest and available at the time of this PDD submission, $EF_{grid,OMsimple,y}$ is estimated to be **0.9913tCO₂e/MWh**. Please refer to Appendix 4 for detailed calculation.

Step 5 Calculate the build margin emission factor (BM)

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

Option 1 For the first crediting period, Calculate the Build Margin Emission Factor $EF_{grid,BM,y}$, *ex-ante* based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the second crediting period should be used. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2 For the first crediting period, the build margin emission factor shall be updated annually, *ex post*, including those units built up to the year of registration of the project activity or, if information up to

year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex ante*, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

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

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

- (a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5-units}$) and determine their annual electricity generation ($AEG_{SET-5-units}$, in MWh);
- (b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total} , in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET-\geq 20\%}$, in MWh);
- (c) From $SET_{5-units}$ and $SET_{\geq 20\%}$ 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% of the annual electricity generation of the project electricity system (if 20% 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% 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% of the annual electricity generation of the project electricity system (if 20% 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 ($SET_{sample-CDM-\rightarrow 10yrs}$).

However, in China, it is very difficult to obtain the data of the five existing power plants built most recently or the power plants supply electricity to the grid that comprise 20% of the annual electricity generation (in MWh) and that were built most recently, since no data of plant specific generation and fossil fuel consumption is currently available in China. As none of the above options can be selected, the following deviations are adopted to calculate the BM¹¹:

First, to calculate the newly added installed capacity and the contribution component of other various power generation technologies, then calculate of the weight of newly added installed capacity of each power generation technology, and finally, to calculate BM emission factor using the commercially

¹¹ <http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM>

optimal efficiency level of each power generation technology.

According to the “Tool to calculate the emission factor for an electricity system” (version 02.2.1), the build margin emissions factor ($EF_{grid,BM,y}$) is calculated as 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. The calculation equation is as follows:

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

Where:

$EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂/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.

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 CO₂ emissions from coal, oil, and gas consumption for power generation to the total CO₂ emission; Second, to calculate the emission factor of the thermal power based on the weight of CO₂ emission from coal, oil, and gas, and the emissions factors using commercial technologies with optimal efficiency. And finally, to multiply the thermal emission factor with the portion of the thermal power comprising 20% of the newly added capacity.

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 (tce) consumed by 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)

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

Coal, Oil and Gas is the feed for solid fuels, liquid fuels and gas fuels.

Sub-Step 2: Calculate the emission factor of thermal power ($EF_{Thermal}$)

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

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are the operating margin emission factors respectively consumed by coal-fired, oil-fired and gas-fired generation technology at the commercially optimal efficiency.

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 added installed capacity of thermal power generation sources (MW) in year y

$CAP_{Total,y}$ = the total added installed capacity of all kinds of power generation sources (MW) in year y which comprises at least 20% of the existing installed capacity

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

Key parameters used to calculate BM emission factor include the low calorific value of each fossil fuel, the oxidation rate, the potential emission factors, and the efficiency of various power generation technologies. The data of low calorific value of each fossil fuel and their oxidation rate comes from China Energy Statistical Yearbook 2011. The potential emission factors are sourced from “2006 IPCC Guidelines for National Greenhouse Gas Inventories” Table 1.3 and Table 1.4 of Page 1.21-1.24 in Chapter one, Volume 2 Energy.

According to the latest and available data at the time of this PDD submission, $EF_{grid,BM,y}$ is calculated to be **0.5398** tCO₂e/MWh. Please refer to Appendix 4 for the details of calculation.

Step 6: Calculate the combined margin emissions factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

- (a) Weighted average CM; or
- (b) Simplified CM.

The weighted average CM method (option a) should be used as the preferred option.

The simplified CM method (option b) can only be used if:

- (a) The project activity is located in (i) a Least Developed Country (LDC) or in (ii) a country with less than 10 registered CDM projects at the starting date of validation or (iii) a Small Island Developing States (SIDS); and
- (b) The data requirements for the application of step 5 above cannot be met.

The PDD I chooses option a.

The combined margin emissions factor is calculated as follows:

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

Where:

- $EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh)
- $EF_{grid,OM,y}$ = Operating margin CO₂ emission factor in year y (tCO₂/MWh)
- ω_{BM} = Weighting of build margin emissions factor(%)
- ω_{OM} = Weighting of operating margin emissions factor (%)

As specified in “Tool to calculate the emission factor for an electricity system” (version 03.0.0), the proposed solar project shall use $\omega_{OM}=0.75$ and $\omega_{BM}=0.25$ for the first crediting period and for subsequent crediting periods.

$$EF_{grid,CM,y} = 0.75 \times EF_{grid,OM,y} + 0.25 \times EF_{grid,BM,y} = 0.75 \times 0.9913 + 0.25 \times 0.5398 = 0.8784 \text{ tCO}_2\text{e/MWh}$$

Leakage

According to the ACM0002, no leakage emissions are considered.

Emissions Reduction (ER_y)

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

$$ER_y = BE_y - PE_y \quad (10)$$

Where:

- ER_y = Emission reductions in year y (tCO₂/yr)
- BE_y = Baseline emissions in year y (tCO₂/yr)
- PE_y = Project emissions in year y (tCO₂/yr)

B.6.2. Data and parameters fixed ex ante

(Copy this table for each piece of data and parameter.)

Data / Parameter	$FC_{i,y} F_{i,j,y}$
Unit	10 ⁴ t or 10 ⁸ m ³
Description	Amount of fossil fuel type <i>i</i> consumed in the project electricity system in year <i>y</i> ; or The amount of fossil fuel type <i>i</i> consumed in the project electricity system of province <i>j</i> in year <i>y</i> .
Source of data	China Energy Statistical Yearbook 2009-2011
Value(s) applied	See Appendix 4 for details
Choice of data or Measurement methods and procedures	Official statistical data
Purpose of data	Used for the calculation of $EF_{grid,BM,y}$ and $EF_{grid,OM,y}$ for baseline emissions
Additional comment	



Data / Parameter	$NCV_{i,y}$
Unit	GJ/mass or volume unit
Description	Net calorific value (energy content) of fossil fuel type i in year y
Source of data	<i>China Energy Statistical Yearbook 2009-2011.</i>
Value(s) applied	See Appendix 4 for details.
Choice of data or Measurement methods and procedures	Official statistical data
Purpose of data	Used for the calculation of $EF_{grid,BM,y}$ and $EF_{grid,OM,y}$ for baseline emissions
Additional comment	

Data / Parameter	$EF_{CO2,i,j,y}$
Unit	t C/TJ
Description	CO ₂ emission factor of fossil fuel type i used in power unit m in year y
Source of data	<i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>
Value(s) applied	See Appendix 4 for details.
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Used for the calculation of $EF_{grid,BM,y}$ and $EF_{grid,OM,y}$ for baseline emissions
Additional comment	

Data / Parameter	EG_y
Unit	MWh
Description	Net electricity generated and delivered to the grid by all power sources in the project electricity system, not including low-cost/must-run power plants/units, in year y
Source of data	<i>China Electric Power Yearbook 2009-2011</i>
Value(s) applied	See Appendix 4 for details.
Choice of data or Measurement methods and procedures	Official statistical data
Purpose of data	Used for the calculation of $EF_{grid,OM,y}$ for baseline emissions
Additional comment	



Data / Parameter	$\eta_{i,Adv,y}$
Unit	tCO ₂ /MWh
Description	Electricity conversion efficiency of the optimal commercial technology in China
Source of data	<i>2012 Baseline Emission Factors for Regional Power Grids in China</i> released by DNA of China
Value(s) applied	See Appendix 4 for details.
Choice of data or Measurement methods and procedures	National official statistics data
Purpose of data	Used for the calculation of $EF_{grid,BM,y}$ for baseline emissions
Additional comment	

Data / Parameter	$EF_{Coal,Adv}$
Unit	kgCO ₂ /TJ
Description	Emission factors reflecting the efficiency level of the best coal-based power generation technology commercially available in China.
Source of data	<i>Notification of 2012 Baseline Emission Factors for Regional Power Grids in China published by China's DNA.</i>
Value(s) applied	See Appendix 4 for details.
Choice of data or Measurement methods and procedures	Official released data
Purpose of data	Used for the calculation of $EF_{grid,BM,y}$ for baseline emissions
Additional comment	

Data / Parameter	$EF_{Oil,Adv}$
Unit	kgCO ₂ /TJ
Description	Emission factors reflecting the efficiency level of the best oil-based power generation technology commercially available in China.
Source of data	<i>Notification of 2012 Baseline Emission Factors for Regional Power Grids in China published by China's DNA.</i>
Value(s) applied	See Appendix 4 for details.
Choice of data or Measurement methods and procedures	Official released data
Purpose of data	Used for the calculation of $EF_{grid,BM,y}$ for baseline emissions
Additional comment	

Data / Parameter	$EF_{Gas,Adv}$
Unit	kgCO ₂ /TJ
Description	Emission factors reflecting the efficiency level of the best gas-based power generation technology commercially available in China.
Source of data	<i>Notification of 2012 Baseline Emission Factors for Regional Power Grids in China published by China's DNA.</i>
Value(s) applied	See Appendix 4 for details.
Choice of data or Measurement methods and procedures	Official released data
Purpose of data	Used for the calculation of $EF_{grid,BM,y}$ for baseline emissions
Additional comment	

Data / Parameter	$CAP_{i,j,y}$
Unit	MW
Description	Installed capacity of power source i of province j of the NWCPG in the year y
Source of data	<i>China Electric Power Yearbook 2009-2011</i>
Value(s) applied	See Appendix 4 for details.
Choice of data or Measurement methods and procedures	Official released data
Purpose of data	Used for the calculation of $EF_{grid,BM,y}$ for baseline emissions
Additional comment	

B.6.3. Ex ante calculation of emission reductions

>>

Project Emissions (PE_y)

The proposed project is a newly built solar PV project, which will use solar technology to generate electricity, not involve the utilization of fossil fuels, so according to the methodology ACM0002, the project emissions within the project boundary is zero, i.e. $PE_y=0$.

Baseline Emissions (BE_y)

According to the description and calculation in Section B.6.1, the combined baseline emission factor of the NWCPG is:

$$EF_{grid,CM,y}=0.8784 \text{ tCO}_2\text{e/MWh}$$

According to the Feasibility Study Report of the proposed project, the estimated average annual electricity generation delivered to the power grid during the first 7 year crediting period is as follows:

Table B-7 the estimated annual net electricity delivered to the grid

year	Annual electricity delivered to the grid (MWh)
01/07/2013~31/12/2013	39,339
01/01/2014~31/12/2014	78,049
01/01/2015~31/12/2015	77,419
01/01/2016~31/12/2016	76,790
01/01/2017~31/12/2017	76,160
01/01/2018~31/12/2018	75,531
01/01/2019~31/12/2019	74,901
01/01/2020~30/06/2020	37,136

Based on equation (1), BE_y is calculated and the results are presented in B.6.4.

Emissions Reduction (ER_y)

The annual estimated emission reductions of the project activity can be calculated by formula (10), and the calculation results are presented in B.6.4.

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

Year	Baseline emissions (t CO ₂ e)	Project emissions (t CO ₂ e)	Leakage (t CO ₂ e)	Emission reductions (t CO ₂ e)
01/07/2013~31/12/2013	34,556	0	0	34,556
01/01/2014~31/12/2014	68,560	0	0	68,560
01/01/2015~31/12/2015	68,007	0	0	68,007
01/01/2016~31/12/2016	67,454	0	0	67,454
01/01/2017~31/12/2017	66,901	0	0	66,901
01/01/2018~31/12/2018	66,348	0	0	66,348
01/01/2019~31/12/2019	65,795	0	0	65,795
01/01/2020~30/06/2020	32,621			32,621
Total	470,242	0	0	470,242
Total number of crediting years	7			
Annual average over the crediting period	67,177	0	0	67,177

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

(Copy this table for each piece of data and parameter.)

Data / Parameter	$EG_{facility,y}$
Unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project to the grid in year y
Source of data	Electricity meter(s)
Value(s) applied	Refer to Table B-7
Measurement methods and procedures	The following parameters shall be measured: 1) The quantity of electricity supplied by the project to the grid ($EG_{export,y}$). Cross check measurement results with records for sold electricity, the smaller value will be used. 2) The quantity of electricity delivered to the project from the grid ($EG_{import,y}$). Cross check measurement results with records for purchased electricity, the larger value will be used. The $EG_{facility,y}$ which will be used for ER calculation, will be calculated by the following equation: $EG_{facility,y} = EG_{export,y} - EG_{import,y}$
Monitoring frequency	Continuous measurement and at least monthly recording
QA/QC procedures	The meters should be calibrated annually by an independent qualified calibration entity in accordance with the relevant national and industrial regulations. Cross check measurement results with records for sold and purchased electricity respectively.
Purpose of data	Calculation of baseline emissions
Additional comment	-

B.7.2. Sampling plan

>>

Not applicable.

B.7.3 Other elements of monitoring plan

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An overall monitoring plan will be put into place in order to guarantee the long-term precise measurement of the proposed project's GHG emission reductions and to have a complete and reliable emission reductions calculation. The details of the monitoring plan are summarized as follows:

1. Operation and management structure of monitoring

In order to obtain reliable monitoring data, the project developer will establish a monitoring management structure. Clear responsibilities will be assigned to all staff involved in the CDM project. A CDM manager will be appointed who will have the overall responsibilities of monitoring the project. The measurement of the electricity exports and imports will be carried out by the monitoring officers. In addition, the project developer will designate internal verifiers who will be responsible for the internal verification of the measurement, the collection of electricity receipts and invoices, and the calculation of the emission reductions.

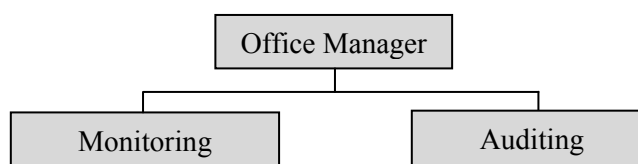


Figure B-4. Operations and Management Structure of the proposed project

The responsibilities of different roles in operation and management structure are described in Table B-8:

Table B-8 Operation and Management Structure

Role	Responsibility
Office manager	- Coordinate with external consultant to design and execute the monitoring plan - Supervise the Monitoring section to ensure a timely, adequate and accurate data recording - Ensure the enforcement of QA/QC plan performed by the Audit section - Collect monitoring data, documents of settlement (transaction records and/or notes) issued by the grid company - Calculate emission reductions and make regular summary following requirements as CDM projects - Work with external consultant to prepare the monitoring report - Assist with CER issuance and DOE communication
Monitoring section	- Collect, record and archive the monitoring data - Maintain the monitoring meters
Audit section	- Perform the routine QA/QC procedure to ensure data accuracy - Ensure timely calibration of the monitoring meters

2. Monitoring equipment and installation

The quantity of electricity exported to the grid and electricity imported from the grid by the proposed project (refer to Section B.7.1) needs to be monitored. The electricity voltage will be transformed to 35kV by box-type transformers, merged and transformed to 110kV by the onsite main transformer and then delivered to the Heihe 110kV substation and finally to NWCPG.

Shown in Figure B-5, the monitoring system includes a main meter (M1) installed at Heihe 110kV substation and a backup meter (M2) installed at the project site. The meters are bidirectional and will be installed in accordance with the national standard '*Electricity meter installation technical management code*' (DL/T448-2000). The accuracy of the meters will be no less accurate than 0.5S.

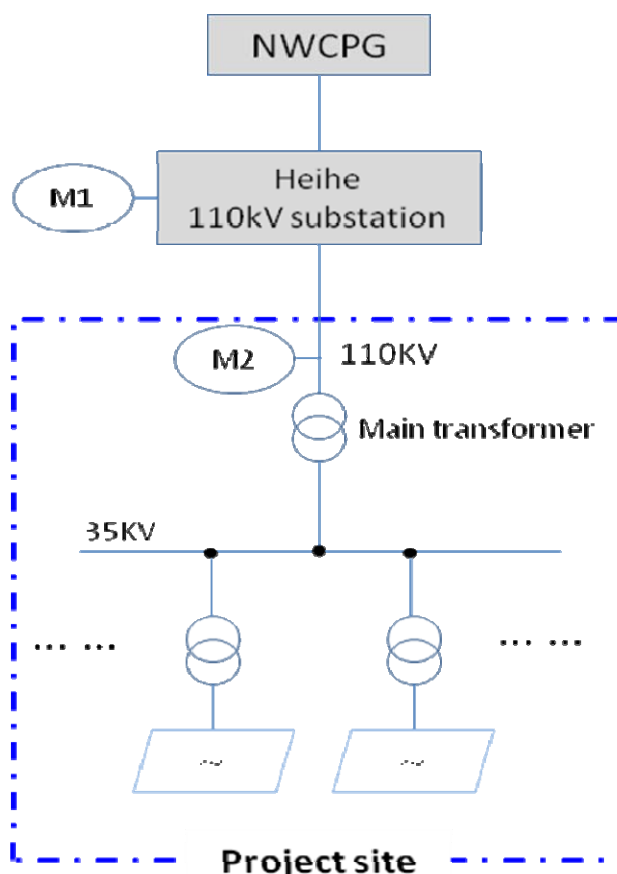


Figure B-5. Diagram of grid connection

3. Data collection and management

The project owner and the local power grid company will read the meters and record the data on a monthly basis. The monitored data will be archived electronically each month. The project owner also needs to keep and periodically back up the copies of electricity sales and purchase receipts provided by the power grid company for cross-check.

All written documents, such as diagrams and reports, should be stored and made available to the verifier, so that the reliability of the information may be checked. All data should be archived for 2 years after the end of the last crediting period.

4. Quality assurance and quality control

The meters should be installed in accordance with the relevant national and industrial regulations. Prior to the project operation, the project owner and the grid company should check the meters according to the relevant national and industrial regulations. The meters should be calibrated annually by an independent qualified calibration entity in accordance with the relevant national and industrial regulations. Data and records will be checked prior to being recorded and archived, and possible errors should be identified at this step. In case the main meter operates abnormally, the readings from the backup meter will be adopted. If both the main and back-up meters are out of order, the data monitored within this certain period shall not be counted. Emission reduction during malfunction periods will be calculated conservatively.

Training on CDM monitoring will be provided to the relevant staff in order to guarantee the implementation of the monitoring plan.



5. Monitoring results and verification

The verification of the monitoring results of the project activity is required for each monitoring period. The monitoring results will be compiled in a monitoring report that will serve as a basis for project verification in each crediting year.

SECTION C. Duration and crediting period**C.1. Duration of project activity****C.1.1. Start date of project activity**

>>

08/05/2012¹²**C.1.2. Expected operational lifetime of project activity**

>>

25 years, 0 month

C.2. Crediting period of project activity**C.2.1. Type of crediting period**

>>

The renewable 7×3 crediting period is applied and this is the first crediting period.

C.2.2. Start date of crediting period

>>

01/07/2013 or the effective registration date, whichever is earlier.

C.2.3. Length of crediting period

>>

7 years, 0 month

¹² The starting date of a CDM project activity is the earliest date at which either the implementation or construction or real action of a project activity begins. According to the definition, the starting date of the proposed project activity is the signature date of the PV Module Purchase Contract, as it is the earliest date at which real action related to the project activity is to be made.

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>

According to the *Classification of Environmental Management for Construction Projects*,¹³ the *Environmental Impact Assessment Registration Form* was submitted to Gansu Environmental Protection Bureau and got approved on 06/06/2012 (Document No.54 [2012]). A summary of the main findings of the EIA is provided as follows:

1. Noise

The noise during construction period is sourced from different equipments, such as loader, excavator, concrete mixer, etc. Some effective measures are adopted, such as strengthen the maintenance of machinery to keep mechanical lubrication and reduce its operation noise; take temporary acoustic measures on high noise equipment and forbid night construction. There is no noise-sensitive target near the project site and the influence to local environment caused by noise produced on project site is insignificant.

The noise of the operation period comes from water pump running and transformer operation noise. Through acoustical insulation and distance decay, the noise can be reduced and reach the relevant standard. Therefore, it will bring little influence to the environment.

2. Air

The dust and soot during construction period is mainly generated by foundation excavation of PV panels and the transport vehicles. During the construction period, effective measures will be taken in order to prevent dust pollution. These measures will include spraying water regularly, sealing vehicles with tarpaulin, avoiding construction on windy days and piling up construction materials in the open air.

The dust and soot during operation period is mainly from the ingress and egress of vehicles; through timely sprinkler cleaning, greening measures as well as small traffic flow, there will be slight impact to the environment.

3. Waste water

Waste water during construction period mainly includes plant staffs' general domestic sewage, but its amount is small and comparatively scattering. As the project area is dry and lack of rain but with big evaporation capacity, the management measures taken by the project owner are as follows: splashing the cleaned domestic sewage for evaporating. Due to its small amount, it will not influence surface runoff and bring little influence to the environment.

During the operation period, sewage from human daily activities will be treated in a digestion tank before it is used for irrigating trees. The waste water from flushing the solar cells will also be collected and deposited and finally recycled for irrigation. So there will be slight impact to the environment.

4. Solid waste

Waste residue during the construction period is mainly the construction garbage (eg. discarded building material and domestic garbage, etc.). Therefore, through balancing the earthwork excavation, the rest of earthwork could be fully used for backfill. The domestic garbage should be cleaned and sent to dump in time to reduce the impact to the surrounding environment.

Waste residue during operation period especially after the plant has been operated for over 10 years, due to renewal of solar cell module, it will generate a certain amount of wasted polycrystalline silicon battery. This part of garbage will be recycled by the manufacturer to realize the comprehensive utilization of

¹³ Issued by the Ministry of Environmental Protection, and has become effective on 1 October 2008.



resources which will not bring bad influence on the environment. Another part of garbage during operation period is also the domestic garbage. As the garbage is little due to the small number of staff, it just needs to be collected and sent to landfill, which will eliminate the impact to environment.

5. Ecological environment

The proposed project is located in a barren and desolate area with sparse vegetation, exposed to dust and high soil erosion. The construction may exacerbate this erosion, but the impact on the ecological environment can be reduced through some preventive and restorative measures, such as minimizing the construction area, replanting drought-proof vegetation, etc. The outmost layer of the solar cell module of the proposed project use the special tempered low radiation glass, thus it will not bring obvious light pollution. Electromagnetic radiation of the project operation is comparatively low and is far from the residential area which will not bring negative influence to residents' health and surrounding radio electrical equipment.

In conclusion, the project activity does not have any major adverse impacts on the environment during its construction and operation. The proposed project is definitely an environment-friendly method for power generation.

D.2. Environmental impact assessment

>>

According to the *Environmental Impact Assessment Registration Form* and its approval, no significant environmental impacts have been discovered by the project participants or the host party.

SECTION E. Local stakeholder consultation**E.1. Solicitation of comments from local stakeholders**

>>

In order to invite stakeholders' comments, during 15/08/2012~16/08/2012, representatives from the project owner conducted a survey among local officials, villagers and residents living in the project area by means of questionnaires. The questionnaires are related to the project's impacts on the local environment, as well as on the region's social and economic development. 30 questionnaires were sent out and all of them were returned. Table E-1 is the information of the respondents.

Table E-1 The detailed respondents' information

Item		Number	Percentage (%)
Total collected questionnaires		30	100
Gender	Male	25	83.3%
	Female	5	16.7%
	Junior Middle School and below	15	50%
	High School	5	16.7%
	College and above	10	33.3%
Age	20~50	28	93.3%
	More than 50	2	6.7%
Occupation	Peasant	20	66.7%
	Government officials	8	26.7%
	Others	2	6.6%

The respondents are representative in terms of age, occupation and education, so their attitude towards the impacts of the project can therefore be seen as a comprehensive reflection of the attitudes of the residents possibly affected by the project.

E.2. Summary of comments received

>>

The results of the survey are presented in Table E-2 below.

Table E-2. Summary of Questionnaires

Item	Response (%)		
1. How much do you know about PV power generation project?	A lot	A little	Nothing
	73.3	20	6.7
2. What do you think the project's impacts on the local electricity supply will be?	Positive	Negative	No impact
	96.7	0	3.3
3. What do you think the project's impacts on the local employment will be?	Positive	Negative	No Impact
	86.7	0	13.3
4. What do you think about the impacts of the proposed project on the current environment?	Positive	Negative	No Impact
	6.7	0	93.3
5. What do you think the project's impact on the local	Promoting	Abating	No change



economy will be?	86.7	0	13.3
6. What's your attitude towards the proposed project?	Positive	Negative	Indifferent
	100	0	0
7. Are you supportive for developing the proposed project as a CDM project?	Positive	Negative	Indifferent
	100	0	0

The survey shows that the local people support and agree with the construction of the project. They believe that the project will have a positive impact on the local economic development and their living conditions, without having negative impacts on the environment and the ecosystem.

E.3. Report on consideration of comments received

>>

Local residents, villagers and government officials are supportive of the proposed project. According to the comments received from the stakeholders, it is not necessary to adjust the construction and operation of the proposed project.



SECTION F. Approval and authorization

>>

Upon submission of this version of PDD, the letter of approval has been got on 26/03/2013.

- - - - -

**Appendix 1: Contact information of project participants**

Organization name	Gansu Heihe Hydropower New Energy Development Co., Ltd.
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Building	
City	Zhangye
State/Region	Gansu Province
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Website	
Contact person	Du Yong
Title	Legal Representative
Salutation	Mr.
Last name	Du
Middle name	
First name	Yong
Department	
Mobile	
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Direct tel.	0936-8226684
Personal e-mail	hhsdyinlongxing@vip.163.com



Organization name	National Development and Reform Commission of the People's Republic of China
Street/P.O. Box	No.38 South Yuetan Street
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Contact person	Sun Cuihua
Title	Vice Director
Salutation	Mrs.
Last name	Sun
Middle name	
First name	Cuihua
Department	
Mobile	
Direct fax	+86 10-68502358
Direct tel.	+86 10-68502963
Personal e-mail	sunch@cccchina.gov.cn



Appendix 2: Affirmation regarding public funding

No public funding from Annex 1 countries is involved in the project activity.



Appendix 3: Applicability of selected methodology

Please refer to section B.2 of the PDD.



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

The baseline information for calculation of *OM*, *BM* and *CM* emission factors of North West China Power Grid is shown in the Report on 2012 Baseline Emission Factors for Regional Power Grids by China DNA at <http://cdm.ccchina.gov.cn> released on 15th October, 2012. The concrete processes are shown in the following tables.

1. Calculation of Operating Margin (OM) Emission Factor

Table 1 CO₂ Emissions from Fuel-fired Power Plants of NWCPG in 2008

Fuel type	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Sub-total	Effective CO ₂ EF	OXID	CO ₂ emission factor of fossil fuel	Average Low Calorific Value	CO ₂ emission (tCO ₂ e)
								(tc/TJ)				(for mass unit)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F*I*J/100000 (for volume unit)
Raw Coal	10 ⁴ t	3620	2216.9	507.44	2330.72	1924.9	10599.96	25.8	100	87,300	20,908	193,477,720
Cleaned Coal	10 ⁴ t						0	25.8	100	87,300	26,344	0
Other Washed Coal	10 ⁴ t	9.22			53.85	8.2	71.27	25.8	100	87,300	8,363	520,335
Briquette	10 ⁴ t						0	26.6	100	87,300	20,908	0
Coke	10 ⁴ t						0	29.2	100	95,700	28,435	0
Coke Oven Gas	10 ⁸ m ³	0.35	0.74			0.13	1.22	12.1	100	37,300	16,726	76,113
Other Gas	10 ⁸ m ³	18.38	0.2				18.58	12.1	100	37,300	5,227	362,249
Crude Oil	10 ⁴ t						0	20	100	71,100	41,816	0
Gasoline	10 ⁴ t	0.05				0.01	0.06	18.9	100	67,500	43,070	1,744
Diesel Oil	10 ⁴ t	1.03	0.44	0.26	0.05	1.64	3.42	20.2	100	72,600	42,652	105,902
Fuel Oil	10 ⁴ t		0.86	0.04		0.02	0.92	21.1	100	75,500	41,816	29,045
LPG	10 ⁴ t						0	17.2	100	61,600	50,179	0
Refinery Gas	10 ⁴ t					7.25	7.25	15.7	100	48,200	46,055	160,939
Natural Gas	10 ⁸ m ³	0.94	0.24	2.99		7.2	11.37	15.3	100	54,300	38,931	2,403,565



Other Petroleum Products	10 ⁴ t					0.01	0.01	20	100	72,200	41,816	302
Other Coke Oven Products	10 ⁴ t						0	25.8	100	95,700	28,435	0
Other Energies	10 ⁴ tC _e	93.67	10.58		21.24		125.49	0	0	0	0	0
											Subtotal	197,137,915

Data source: China Energy Statistical Yearbook 2009

Table 2 Emissions from Fuel-fired Power Plants of NWCPG in 2008

Province	Total generation (10 ⁸ kWh)	Total generation (MWh)	Self-consumption electricity (%)	Total supply (MWh)
Shaanxi	715	71,500,000	6.95	66,530,750
Gansu	468	46,800,000	6.4	43,804,800
Qinghai	107	10,700,000	7.14	9,936,020
Ningxia	440	44,000,000	7.57	40,669,200
Xinjiang	397	39,700,000		39,700,000
Total		212,700,000		200,640,770

Data source: China Electric Power Yearbook 2009

Table 3 Calculation on Simple OM Emission Factor of NWCPG in 2008

Total emission amount in NWCPG	197,137,915 tCO₂
Total power supply in NWCPG	200,640,770 MWh
Emission factor in NWCPG	0.98254 tCO₂/MWh

Data source: China Electric Power Yearbook 2009, China Energy Statistical Yearbook 2009

Table 4 CO₂ Emission from Fuel-fired Power Plants of NWCPG in 2009

Fuel type	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Sub-total	Effective CO ₂ EF	OXID	CO ₂ emission factor of fossil fuel	Average Low Calorific Value	CO ₂ emission (tCO ₂ e)
								(tc/TJ)	(%)	(kgCO ₂ /TJ)	(MJ/t, km ³)	K=F*I*J/100000 (for mass unit)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F*I*J/100000 (for volume unit)
Raw Coal	10 ⁴ t	3949.22	2060	467.05	2350.13	2380	11206.4	25.8	100	87,300	20,908	204,546,878
Cleaned Coal	10 ⁴ t						0	25.8	100	87,300	26,344	0
Other Washed Coal	10 ⁴ t	8.34			56.01	6.66	71.01	25.8	100	87,300	8,363	518,437
Briquette	10 ⁴ t						0	26.6	100	87,300	20,908	0
Coke	10 ⁴ t						0	29.2	100	95,700	28,435	0
Coke Oven Gas	10 ⁸ m ³	0.49	0.8			0.12	1.41	12.1	100	37,300	16,726	87,967
Other Gas	10 ⁸ m ³	18.37	0.44				18.81	12.1	100	37,300	5,227	366,733
Crude Oil	10 ⁴ t						0	20	100	71,100	41,816	0
Gasoline	10 ⁴ t	0.02					0.02	18.9	100	67,500	43,070	581
Diesel Oil	10 ⁴ t	0.6	0.52	0.2	0.07	0.7	2.09	20.2	100	72,600	42,652	64,718
Fuel Oil	10 ⁴ t		0.25	0.08		0.06	0.39	21.1	100	75,500	41,816	12,313
LPG	10 ⁴ t	0.02					0.02	17.2	100	61,600	50,179	618
Refinery Gas	10 ⁴ t					8.56	8.56	15.7	100	48,200	46,055	190,019
Natural Gas	10 ⁸ m ³	0.91	0.07	3.93		7.83	12.74	15.3	100	54,300	38,931	2,693,177
Other Petroleum Products	10 ⁴ t						0	20	100	72,200	41,816	0
Other Coke Oven Products	10 ⁴ t						0	25.8	100	95,700	28,435	0



Other Energies	10 ⁴ tC _e	73.76	18.52		18.08		110.36	0	0	0	0	0
											Subtotal	208,481,441

Data source: China Energy Statistical Yearbook 2010

Table 5 Fuel-fired Power Generation of NWCPG in 2009

Province	Total generation (10 ⁸ kWh)	Total generation (MWh)	Self-consumption electricity (%)	Total supply (MWh)
Shaanxi	774	77,400,000	7.24	71,796,240
Gansu	441	44,100,000	6.88	41,065,920
Qinghai	107	10,700,000	7.01	9,949,930
Ningxia	447	44,700,000	7.76	41,231,280
Xinjiang	452	45,200,000	5.16	42,867,680
Total		222,100,000		206,911,050

Data source: China Electric Power Yearbook 2010

Table 6 Calculation on Simple OM Emission Factor of NWCPG in 2009

Total emission amount in NWCPG	208,481,441 tCO ₂
Total power supply in NWCPG	206,911,050 MWh
Emission factor in NWCPG	1.00759 tCO ₂ /MWh

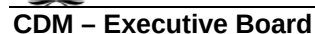
Data source: China Electric Power Yearbook 2010, China Energy Statistical Yearbook 2010

Table 7 CO₂ Emission from Fuel-fired Power Plants of NWCPG in 2010

Fuel type	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Sub-total	Effective CO ₂ EF	OXID	CO ₂ emission factor of fossil fuel	Average Low Calorific Value	CO ₂ emission (tCO ₂ e)
								(tc/TJ)	(%)	(kgCO ₂ /TJ)	(MJ/t, km ³)	K=F*I*J/100000 (for mass unit)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F*I*J/100000 (for volume unit)



Raw Coal	10 ⁴ t	4850.49	2771.8 9	483.72	2916.4 6	2494.9	13517.46	25.8	100	87,300	20,908	246,729,926
Cleaned Coal	10 ⁴ t				1.05		1.05	25.8	100	87,300	26,344	24,148
Other Washed Coal	10 ⁴ t	11.01			42.96	6.82	60.79	25.8	100	87,300	8,363	443,822
Briquette	10 ⁴ t						0	26.6	100	87,300	20,908	0
Coke	10 ⁴ t						0	29.2	100	95,700	28,435	0
Coal Gangue	10 ⁴ t	355.13	37.86		163.58	2.85	559.42	25.8	100	87,300	8363	4,084,269
Coke Oven Gas	10 ⁸ m3	1.97	0.89			0.7	3.56	12.1	100	37,300	16,726	222,101
Blast Furnace Gas	10 ⁸ m3	18.24	4.06			5.28	27.58	70.8	100	219,000	3763	2,272,860
LDG	10 ⁸ m3		0.31				0.31	46.9	100	145,000	7945	35,713
Other Gas	10 ⁸ m3						0	12.1	100	37,300	5,227	0
Crude Oil	10 ⁴ t						0	20	100	71,100	41,816	0
Gasoline	10 ⁴ t	0.01		0.03		0.01	0.05	18.9	100	67,500	43,070	1,454
Diesel Oil	10 ⁴ t	0.67	0.42	0.21	0.23	0.39	1.92	20.2	100	72,600	42,652	59,453
Fuel Oil	10 ⁴ t		0.17	0.09	0.1	0.7	1.06	21.1	100	75,500	41,816	33,465
Naphtha	10 ⁴ t						0	20.2	100	72,600	43,906	0
Lubricating Oil	10 ⁴ t						0	20	100	71,900	41,398	0
Paraffin	10 ⁴ t						0	20	100	72,200	39,934	0
Solvent Naphtha	10 ⁴ t						0	20	100	72,200	42,945	0
Petroleum Asphalt	10 ⁴ t						0	21	100	69,300	38,931	0
Petroleum Coke	10 ⁴ t						0	26.6	100	82,900	31,947	0
LPG	10 ⁴ t						0	17.2	100	61,600	50,179	0
Refinery Gas	10 ⁴ t					12.2	12.2	15.7	100	48,200	46,055	270,822
Natural Gas	10 ⁸ m ³	0.87		2.48	0.3	8.54	12.19	15.3	100	54,300	38,931	2,576,909
Other Petroleum Products	10 ⁴ t					0.01	0.01	20	100	72,200	41,816	302
Other Coke Oven Products	10 ⁴ t						0	25.8	100	95,700	28,435	0
Other Energies	10 ⁴ tC e	1.76	2.68				4.44	0	0	0	0	0



Data source: China Energy Statistical Yearbook 2011

Table 8 Fuel-fired Power Generation of NWCPG in 2010

Data source: China Electric Power Yearbook 2011

Table 9 Calculation on Simple OM Emission Factor of NWCPG in 2010

Data source: China Electric Power Yearbook 2011, China Energy Statistic Yearbook 2011

Weighted Average Emission Factor of 3 years: 0.9913tCO₂/MWh



2. Calculation of Build Margin (BM) Emission Factor

Step 1. Calculating the share of CO₂ emissions of different fuel-fired power plants in the total CO₂ emissions

Table 10 The Proportion of CO₂ Emissions of Different Fuel-fired Power Plants in the Total CO₂ Emissions

Energy	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total	NCV	Emission factor (tC/TJ)	Oxidation rate (%)	Emission (tCO ₂ e)
								(MJ/t or 1000m ³)			
		A	B	C	D	E	G=A+...+F	H	I	J	K=G*H*I*J/100,000
Raw Coal	10 ⁴ t	4,850.49	2,771.89	483.72	2,916.46	2,494.90	13,517.46	20,908	87,300	1	246,729,926
Cleaned coal	10 ⁴ t	0	0	0	1.05	0	1.05	26,344	87,300	1	24,148
Other washed coal	10 ⁴ t	11.01	0	0	42.96	6.82	60.79	8,363	87,300	1	443,822
Briquette	10 ⁴ t	0	0	0	0	0	0.00	20,908	87,300	1	0
Coal Gangue	10 ⁴ t	355.13	37.86	0	163.58	2.85	559.42	8,363	87,300	1	4,084,269
Coke	10 ⁴ t	0	0	0	0	0	0.00	28,435	95,700	1	0
Other Coke Oven Products	10 ⁴ t	0	0	7.99	0	0	7.99	28,435	95,700	1	217,426
Sub-Total											251,499,591
Crude oil	10 ⁴ t	0	0	0	0.00	0	0	41,816	71,100	1	0
Gasoline	10 ⁴ t	0.01	0	0.03	0	0.01	0.05	43,070	67,500	1	1,454
Diesel	10 ⁴ t	0.67	0.42	0.21	0.23	0.39	1.92	42,652	72,600	1	59,453
Fuel oil	10 ⁴ t	0	0.17	0.09	0.1	0.7	1.06	41,816	75,500	1	33,465
Petroleum Coke	10 ⁴ t	0	0	0	0	0	0	31,947	82,900	1	0
Other petroleum products	10 ⁴ t	0	0	0	0	0.01	0.01	41,816	75,500	1	316
Sub-Total											94,688
Nature gas	10 ⁷ m ³	8.7	0	24.8	3	85.4	121.9	38,931	54,300	1	2,576,909



Liquefied Natural Gas	10 ⁴ t	0	0	0	0	0	0	51,434	54,300	1	0
Coke oven gas	10 ⁷ m ³	19.7	8.9	0	0	7	35.6	16,726	37,300	1	222,101
Blast Furnace Gas	10 ⁷ m ³	182.4	40.6	0	0	52.8	275.8	3,763	219,000	1	2,272,860
LDG	10 ⁷ m ³	0	3.1	0	0	0	3.1	7,945	145,000	1	35,713
Other coal gas	10 ⁷ m ³	0	0	0	0	0	0	5,227	37,300	1	0
LPG	10 ⁴ t	0	0	0	0	0	0	50,179	61,600	1	0
Refinery gas	10 ⁴ t	0	0	0	0	12.2	12.2	46,055	48,200	1	270,822
Sub-Total											5,378,404
Other Energy	10 ⁴ t	1.76	2.68	0	0	0	4.44	0	0	0	0
Total											256,972,683

Data source: China Energy Statistical Yearbook 2011

Based on table above and formula B.3, B.4 and B.5, $\lambda_{\text{Coal},y} = 97.87\%$, $\lambda_{\text{Oil},y} = 0.04\%$, $\lambda_{\text{Gas},y} = 2.09\%$

Step 2. Calculating the emission factor of fuel-fired power technology

The best efficiencies and emission factors of the coal, oil and gas fired power technology are listed in Table 11.

Table 11 The Best Efficiencies and Emission Factors of the fuel-fired technologies

	Parameter	Efficiency of Power Supply (%)	Emission Factor of Fuel (kgCO ₂ /TJ)	Oxidation Factor	Emission Factor (tCO ₂ /MWh)
		A	B	C	D=3.6/A/1,000,000*B*C
Coal-fired Power Plant	$EF_{\text{Coal},\text{Adv},y}$	39.65	87,300	1	0.7927
Oil-fired Power Plant	$EF_{\text{Oil},\text{Adv},y}$	51.93	75,500	1	0.5234
Gas-fired Power Plant	$EF_{\text{Gas},\text{Adv},y}$	51.93	54,300	1	0.3765

$$EF_{\text{Thermal},y} = \lambda_{\text{Coal},y} \times EF_{\text{Coal},\text{Adv},y} + \lambda_{\text{Oil},y} \times EF_{\text{Oil},\text{Adv},y} + \lambda_{\text{Gas},y} \times EF_{\text{Gas},\text{Adv},y} = 97.87\% \times 0.7927 + 0.04\% \times 0.5234 + 2.09\% \times 0.3765 = 0.78386 \text{ tCO}_2\text{e/MWh}$$

**Table 12 Installed Capacity of the NWCPG in 2010**

	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	MW	21,370	13,240	1,930	12,710	11,720	60,970
Hydro power	MW	2,210	6,110	10,680	430	2,990	22,420
Nuclear power	MW	0	0	0	0	0	0
Wind power and other	MW	0	1,390	0	600	1,360	3,352
Total	MW	23,580	20,740	12,610	13,740	16,070	86,742

Data sources: *China Electric Power Yearbook 2011***Table 13 Installed Capacity of the NWCPG in 2009**

	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	MW	19,900	10,990	1,930	8,820	9,520	51,160
Hydro power	MW	1,920	5,940	8,740	430	2,430	19,460
Nuclear power	MW	0	0	0	0	0	0
Wind power and other	MW	0	750	0	270	860	1,880
Total	MW	21,820	17,680	10,670	9,520	12,810	72,500

Data sources: *China Electric Power Yearbook 2010***Table 14 Installed Capacity of the NWCPG in 2008**

	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	MW	17,850	8,980	2,000	7,540	8,200	44,570
Hydro power	MW	1,810	5,440	5,910	430	2,190	15,780
Nuclear power	MW	0	0	0	0	0	0
Wind power and other	MW	0	600	0	170	510	1,280
Total	MW	19,660	15,020	7,910	8,140	10,900	61,630

Data sources: *China Electric Power Yearbook 2009*

**Step 3. Calculating the $EF_{BM,y}$ of NWCPG****Table 15 BM Calculation of the NWCPG**

	Installed capacity in 2008	Installed capacity in 2009	Installed capacity in 2010	Newly added capacity from 2008 to 2010 ¹	Newly added capacity from 2009 to 2010 ²	Share in total capacity additions
	(MW)	(MW)	(MW)	(MW)	(MW)	(MW)
	A	B	C	D	E	F
Thermal power	44,570	51,160	60,970	19,270	12,020	68.87%
Hydro power	15,780	19,460	22,420	6,640	2,960	23.73%
Nuclear power	0	0	0	0	0	0.00%
Wind power and Other	1,280	1,880	3,352	2,072	1,472	7.40%
Total	61,630	72,500	86,742	27,982	16,452	100.00%
Share in total installed capacity of 2010				32.26%	18.97%	

1,2 with consideration of installed capacity, capacity of units under shutdown, the pumped-storage power generating capacity

$$EF_{BM,y} = 0.78386 \times 68.87\% = 0.5398 \text{ tCO}_2/\text{MWh}$$

3. Calculating the baseline emission factor (EF_y)

According to formula in section B.6.1, the baseline emission factor of the SCPG is calculated as:

$$EF_y = 0.9913 \times 0.75 + 0.5398 \times 0.25 = 0.8784 \text{ tCO}_2/\text{MWh}$$

The EF_y applied in this report is fixed for a crediting period and may be revised at the renewal of the crediting period.



Appendix 5: Further background information on monitoring plan

Please refer to section B.7.

**Appendix 6: Summary of post registration changes**

Not applicable.

History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	EB 66 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	EB 25, Annex 15 26 July 2006	
02	EB 14, Annex 06b 14 June 2004	
01	EB 05, Paragraph 12 03 August 2002	Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Registration		