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

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Tianrun Hami 20MW Solar Power Generation Project
Version number of the PDD	02
Completion date of the PDD	30/11/2012
Project participant(s)	Hami Tianrun New Energy Co., Ltd. Vitol S.A.
Host Party(ies)	People's Republic of China
Sectoral scope(s) and selected methodology(ies)	Sectoral Scope 1: Energy industries; ACM0002 Version 13.0.0
Estimated amount of annual average GHG emission reductions	27,452tCO_2/yr

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Tianrun Hami 20MW Solar Power Generation Project (hereinafter referred to as "the proposed project") is located at Hami City, Xinjiang Uygur Autonomous Region, P.R.China, which is invested by Hami Tianrun New Energy Co., Ltd.. The primary objective of the proposed project is to generate renewable electricity to meet the ever-increasing demand in the Northwest China Power Grid (NWCPG).

Prior to the implementation of the proposed project, equivalent amount of electricity generated by the project activity would have been supplied by NWCPG.

The proposed project is aimed at generation of electricity by using renewable solar power, the electricity generated will be delivered to the NWCPG and replacing equivalent electricity generated by fossil fuel fired power plants connected to the NWCPG, therefore reducing greenhouse gas emissions comparing with fuel fired power plants. The total installed capacity is 20MW and the estimated annual average electricity production of the proposed project is about 30626.66 MWh in 25 years operational lifetime[1], and the estimated annual emission reductions are 27,452 tCO_2e and 192,164 tCO_2e in the first crediting period.

The baseline scenario as identified in the Section B.4. of the PDD is the same as the scenario existing prior to the implementation of the proposed project.

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

- Improvement of global and local air environment quality by reducing GHG and air pollutants (e.g. SO_2, NO_x and particulates) emissions from the combustion of fossil fuels that will be replaced by the photovoltaic power station which is clean and renewable energy source;
- Diversifying power sources and making use of more clean energy;
- Creating new employment opportunities for the local residents and increasing their incomes;
- Promoting local economy development.

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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Xinjiang Uygur Autonomous Region

A.2.3. City/Town/Community etc.

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Hami City

A.2.4. Physical/ Geographical location

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The proposed project is in Hami City, Xinjiang Uygur Autonomous Region, P. R. China. The four corner geographical coordinates of the project site are

[1] In general, the power generation of photovoltaic power project presents downward trend from the beginning to the end of operational period due to solar cell aging, hence the estimated annual average electricity production is the average over the whole operational lifetime.

93°36'19.50"E 43°02'28.96"N
93°36'51.99"E 43°02'28.80"N
93°36'52.26"E 43°02'58.34"N
93°36'19.78"E 43°02'58.50"N

The location of the project is provided in Fig. A.1:

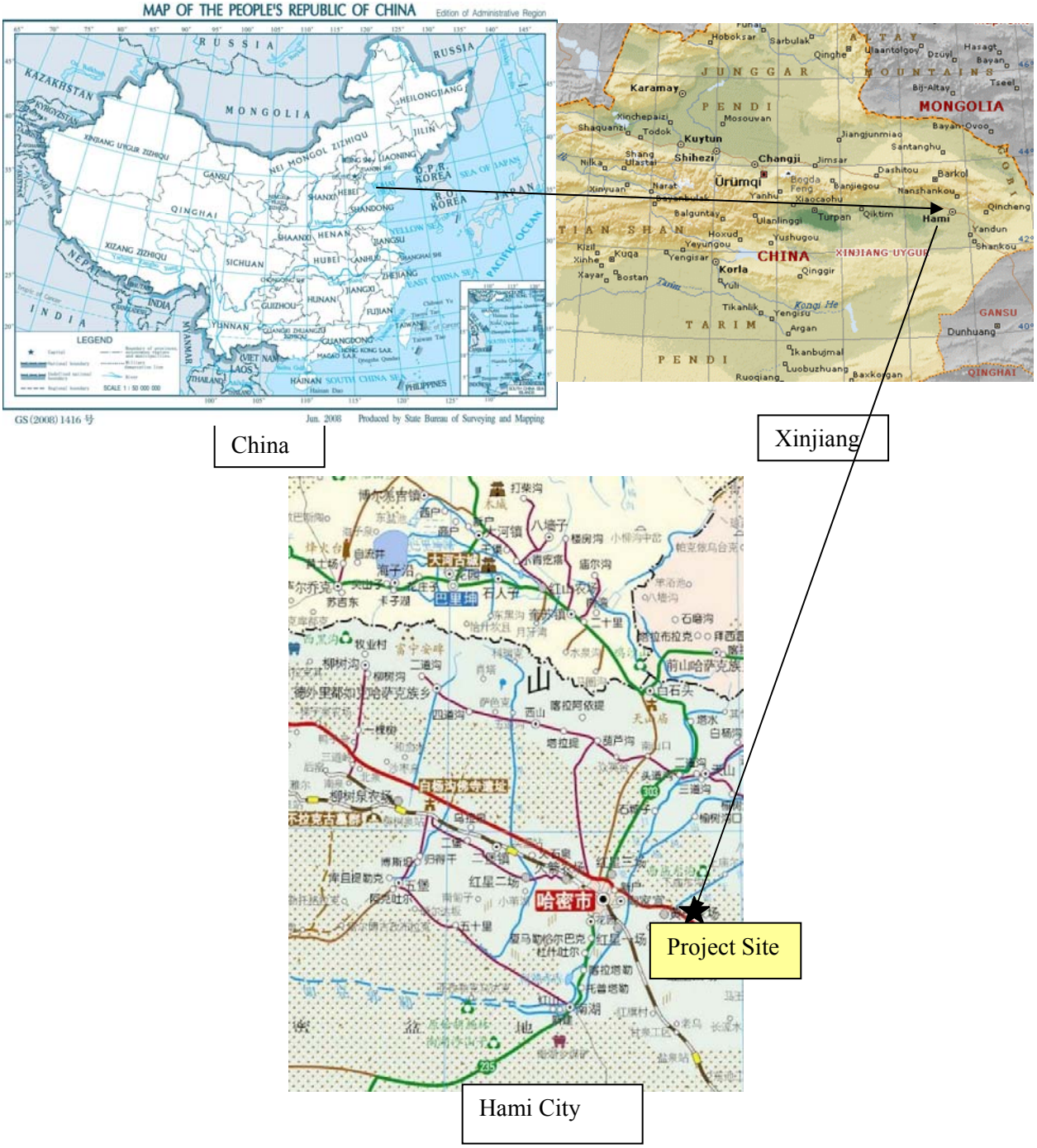

Figure 1. The location of the proposed project

A.3. Technologies and/or measures

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Baseline scenario

The electricity generated by the project would have been supplied by the NWCPG, prior to the start of the implementation of the project activity, which is the same as the baseline scenario. The NWCPG is dominated by electricity generated by fossil fuel fired power plants, whose by-products are GHGs (main emissions: CO_2).

The Project Activity Scenario

The whole power generation system is mainly composed of solar cell module, inverter and step-up transformer. The total installed capacity of the grid connected photovoltaic power station is about 20MW which form 20 sets of power generation units, each power generation unit is about 1MW and will be equipped with two inverters. About 71,680 polycrystalline silicon solar cells with fixed bracket will be installed, and each capacity of the cell is 280Wp. The average annual operation hour is 1531.3h, thus the average Power Load Factor is 17.48%. And the converter efficiency of the power plant is 98.7%,

The DC electric power generated by the photovoltaic modules will be gathered into header box, and then converted into AC power through inverters, then stepped up through transformers, then the electricity generated by the proposed project will be delivered to a local 220kV substation which belongs to Xinjiang Power Grid and finally to NWCPG.

Following table 2~4 are the technical parameters of main equipments:

Table 2. Parameters of polycrystalline silicon solar cells

Parameter	Unit	Value
Model	-	STP280-24/Vd
Rated maximum power	Wp	280
Working voltage	V	35.2
Working current	A	7.95
Weight	kg	19.5
Designed lifetime	Year	25

Table 3. Parameters of Inverter

Parameter	Unit	Value
Model	-	TBEA-GC-500KTL
Rated output power	kW	500
Maximum Efficiency	%	98.7
Technical lifetime	Year	25

Table 4. Parameters of box transformer

Parameter	Unit	Value
Model	-	S11-1000/35/0.3/0.3
Rated Power	kVA	1000
Rated voltage	kV	35

As the equipment purchase contract is not issued, the technical parameters are derived from the FSR.
The proposed project does not involve any technology transfer.

The proposed project is a photovoltaic power station utilizes a renewable energy technology which directly produces electricity energy from solar energy. It has been proved that the photovoltaic power technology is a reliable environmentally sound technology due to its inherent advantages as no agricultural land to be occupied, no noise, no fuel consumption and no GHG emissions.
The main meter will be installed at the connected point between the proposed project and power grid, this meter measures the power supplied to the grid and the electricity use of power plant supplied by the grid. The backup meter will be located at the same place with main meter.

The project owner will carry out training to enable staff become familiar with the operation of solar power generation project. Besides, the manufacturer of the equipments will also provide on-site trainings regarding the plant operations.

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)	Hami Tianrun New Energy Co., Ltd. (as the project owner)	No
Switzerland	Vitol S.A.(as the buyer)	No

A.5. Public funding of project activity

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There is no public funding from Annex I countries involved in the proposed project.

SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

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Approved consolidated baseline and monitoring methodology ACM0002 (Version 13.0.0): *Consolidated baseline and monitoring methodology for grid-connected electricity generation from renewable sources.*

"Tool to calculate the emission factor for an electricity system" (Version 02.2.1) is applied to calculated emission factors.

"Tool for the demonstration and assessment of additionality" (Version 06.0.0) is applied to demonstrate the additionality of the project.

All above methodologies and tools can be found at the UNFCCC website:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

B.2. Applicability of methodology

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The proposed project can meet the applicability criteria of ACM0002, as described below:

- The project is the new renewable solar power plant at a site where no renewable power plant was operated prior to the implementation of the proposed project (Greenfield plant);
- The project is not an activity that involves switching from fossil fuels to renewable energy sources at the site of the proposed project;
- The project is not a biomass fired power plant.

Therefore, the methodology is applicable to the proposed project.

B.3. Project boundary

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According to the definition of project boundary by ACM0002 (Version 13.0.0), the project boundary includes the project power plant, and all power plants connected physically to the electricity system where the proposed project is connected to.

The electricity system is defined according to "Tool to calculate the emission factor for an electricity system" (Version 02.2.1).

In this specific case, the electricity generated by the project will be transferred to the Xinjiang Grid which is connected to the NWCPG. The space boundary of this project consists of the physical and geological boundary of this proposed project, and all the other power plants connected to the NWCPG. The NWCPG is a large regional grid, which consists of six sub-grids: Shaanxi Province, Gansu Province, Xinjiang Uygur Autonomous Region, Ningxia Hui Autonomous Region and Qinghai Province[2].

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in below table:

Table B.1 Emissions sources included in or excluded from the Project Boundary

Source	GHGs	Included?	Justification / Explanation

[2] "2011 Baseline Emission Factors for Regional Power Grids in China" announced by Office of National Coordination Committee on Climate Change , National Development and Reform Commission (NDRC) of China (DNA of China) on 20th Oct, 2011. http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf

Baseline scenario	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Included	Main emission source
		CH_4	Excluded	Minor emission source
		N_2O	Excluded	Minor emission source
Project scenario	Proposed Project	CO_2	Excluded	Minor emission source
		CH_4	Excluded	Minor emission source
		N_2O	Excluded	Minor emission source

The project boundary is shown in Figure B-1.

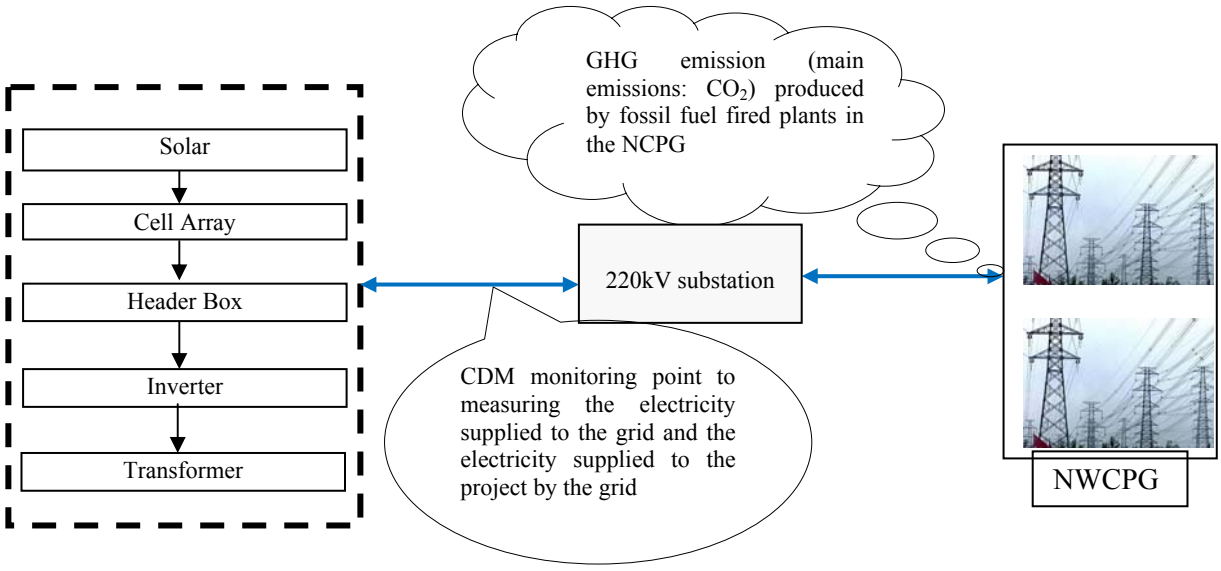

Fig. B-1 Project Boundary

B.4. Establishment and description of baseline scenario

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The proposed project is the installation of a new grid-connected renewable power plant, and the baseline scenario is the following as per ACM0002 (Version 13.0.0):

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, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system (02.2.1)".

The power generated by the proposed project is connected to Xinjiang Grid, and then to the NWCPG. Therefore, the baseline scenario of the proposed project is as follows:

The equivalent annual electricity generated by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources connected to the NWCPG, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1).

The basic parameters used for calculating baseline emissions of the project are provided in Table B.2:

Table B.2 Basic parameters used for calculating baseline emissions

Parameters	Value	Data sources
The operating margin emission factor ($EF_{grid,OM,y}$) of the NWCPG(tCO_2e/MWh)	1.0001	Chinese DNA: *2011 Baseline Emission Factors for Regional Power Grids in China*. (See details in Appendix 4)
The build margin emission factor($EF_{grid,BM,y}$) of the NWCPG(tCO_2e/MWh)	0.5851	Chinese DNA: *2011 Baseline Emission Factors for Regional Power Grids in China*. (See details in Appendix 4)
Average Annual net electricity supplied to grid($EG_{facility,y}$,MWh/yr)	30626.66	FSR

B.5. Demonstration of additionality

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The main events related to the consideration of CDM in the decision to proceed with the project activity are illustrated below. An overview of key events is given in Table B.3

Table B.3 Overview of key events in the development of the project

Date	Key Events
Jan. 2012	The Feasibility Study Report (FSR) was completed
April. 2012	The Environmental Impact Report (EIA) was finished
03/05/2012	The EIA was approved by Xinjiang Environmental Protection Bureau
25/06/2012	The FSR was approved by Xinjiang DRC
02/07/2012	Directorate decided to apply the project as a CDM project
13/07/2012	ERPA was signed by PPs
18/07/2012	PDD was GSP on UNFCCC website
12/11/2012	Road Construction Contract signed(Project starting date)

The additionality of the project activity is demonstrated by using the steps described in the "Tool for the Demonstration and Assessment of Additionality" (Version 06.0.0) as proposed on the 65th EB meeting.

Step 1: Identification of Alternatives to the Project Activity Consistent with Current Laws and Regulations

Sub-Step1a. Define alternatives to the project activity

According to Clause (4) quoted from "*Tool for the demonstration and assessment of additionality*" (Version 06.0.0), project activities that apply this tool in context of approved consolidated methodology ACM0002 (Version 13.0.0), only need to identify that there is at least one credible and feasible alternative that would be more attractive than the proposed project activity;

Therefore, these alternatives are to include:

a) The proposed project activity undertaken without being registered as a CDM project activity.
b) Supply of equivalent annual electricity output supplied by NWCPG.

Outcome of Step 1a: Identified realistic and credible alternative scenario(s) to the project activity

In conclusion, realistic and credible alternatives available to the project that provide outputs or services comparable to the project activity include:

a) The proposed project activity undertaken without being registered as a CDM project activity.
b) Supply of equivalent annual electricity output supplied by NWCPG.

Sub-Step1b. Consistency with Mandatory Laws and Regulations

Alternative a) and b) both comply with China current law and regulations, but doesn't belong to mandatory scope.

Outcomes of sub-step 1b:

Therefore, alternative a) and alternative b) comply with China's regulations and will be analyzed in Step 2 as potential alternative scenarios.

Outcome of step 1

The alternatives are identified reasonable and in line with Current Laws and Regulations.

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 sale of certified emission reductions (CERs)

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

Sub-step 2a. Determine appropriate analysis method

The additionality tool provides three investment analysis options which are: simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III). Since this proposed project has the revenues from the sales of electricity and the b) alternative isn't a proposed investment project, we choose option III, i.e. benchmark analysis to this proposed project.

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

According to the *Interim rule on Economic Assessment of Electric Engineering Retrofit Projects*[3], published by China Electric Power Press, the post-tax Project IRR of electric power project should not be below the threshold of 8%.

Sub-step 2c. Calculation and comparison of financial indicators (only applicable to options II and III):

All input values used for IRR calculation are from the approved FSR, and the FSR was completed by an independent and certified institute and approved by government, the FSR therefore can be considered as an independent and realistic assessment of the proposed project activity, including the parameters listed and used as input values in the IRR calculation.

The basic parameters for calculating of the key financial parameters are provided in Table B.4:

Table B.4 Basic Financial Parameters of the Project

[3] Interim rule on Economic Assessment of Electric Engineering Retrofit Projects , China Electric Power Press, Beijing, 2003.

Basic Parameters	Unit	Value	Source
Installed Capacity	MW	20	FSR
Average Annual net electricity supplied to the grid	MWh	30626.66	
Fixed asset investment	Million CNY	268.68	
Long-term loan Interest	%	7.05	
Electricity tariff (with VAT)	CNY/kWh	1.00[4]	
VAT	%	17	
Urban Construction Tax	%	5	
Surcharge for Education	%	3	
Income Tax	%	25	
Depreciation Rate	%	6.33	
Period of Depreciation	years	15	
Residual Rate	%	5	
Annual O&M Cost	Million CNY	2.3588	
Operating Period	years	25	
CER price	CNY /tCO_2e	100	Expected

The post-tax Project IRR of the project activity is shown in Table B.5.

Table B.5 post-tax Project IRR of the project activity

	Post-tax Project IRR
Without CDM revenue	5.70%
With CDM revenue	6.25%

Based on the benchmark IRR for financial evaluation according to the *Economical Assessment Temporary Regulation on Electrical Technology Improvement Project,* the post-tax Project IRR of a solar power project based should not be lower than the benchmark of 8%. The post-tax Project IRR is 5.70% without CDM revenue which is lower than the benchmark rate of 8%. So the project faces obvious financial barriers without CDM revenue. But the post-tax Project IRR will achieve 6.25% with CER income. Therefore, the CDM revenue can improve the economical attraction of the project.

Sub-step 2d. Sensitivity analysis (only applicable to options II and III):

The sensitivity analysis is conducted to check whether, under reasonable variations in the critical assumptions, the results of the analysis remain unaltered. According to GUIDELINES ON THE ASSESSMENT OF INVESTMENT ANALYSIS (Version 05, EB 62 Annex 5), the fixed asset investment constitutes more than 20% of total project costs. The product of electricity tariff and Average Annual net electricity supplied to the grid constitute more than 20% of the total revenue of the project. The total O&M throughout the project lifetime also accounts for more than 20% of the project cost, hence, following parameters are assumed to be critical assumptions:

- Fixed Asset investment
- Annual O&M Cost
- Electricity tariff
- Average Annual net electricity supplied to the grid

According to the FSR, sensitivity analysis was conducted to check under variation of ±10%. So we make a sensitivity analysis under variations of ±10% in the critical assumptions. Table B.6 summarizes the results of the sensitivity analysis, while Fig. B.2 provides a graphic depiction.

Table B.6 Impact of Variations in Critical Assumptions on post-tax Project IRR

[4] Based on the tariff document of Fa gai jia ge [2011] No.1594

	-10%	-5%	0%	5%	10%
Fixed asset investment	6.95%	6.31%	5.70%	5.14%	4.59%
Annual O&M Cost	6.00%	5.85%	5.70%	5.56%	5.42%
Electricity tariff	4.39%	5.06%	5.70%	6.33%	6.94%
Average Annual net electricity supplied to the grid	4.39%	5.06%	5.70%	6.33%	6.94%

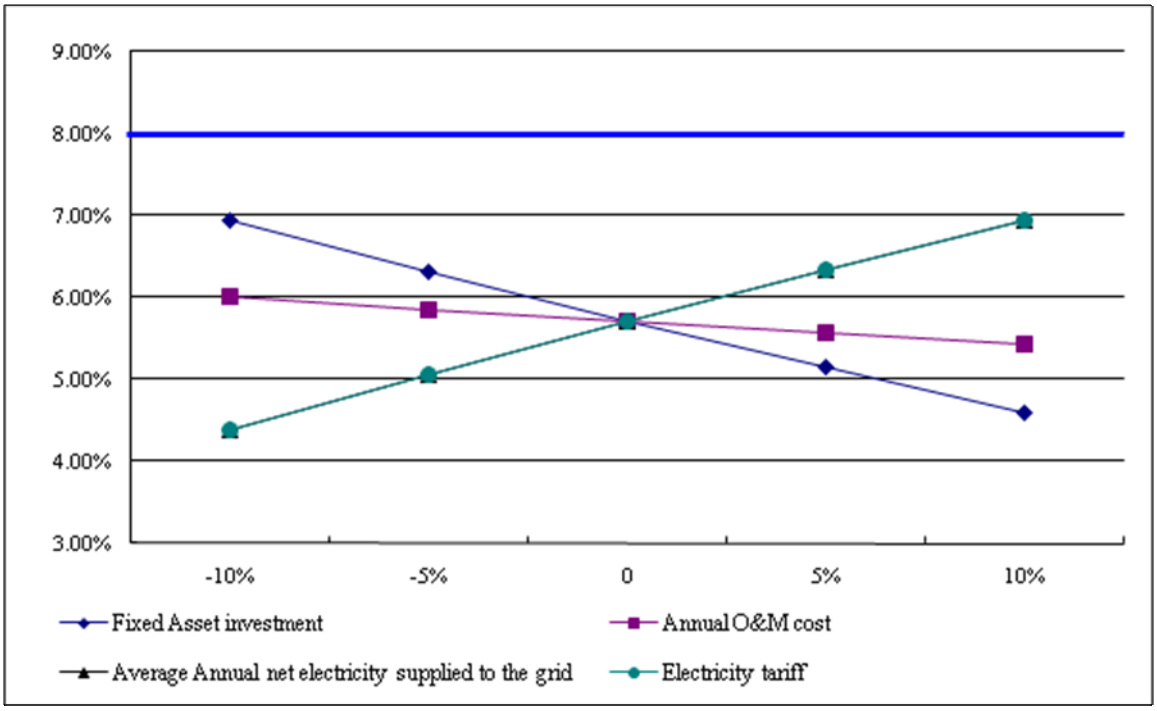

Fig. B.2 post-tax Project IRR Sensitivity Analysis

It can be seen that with the parameters under variations of ±10%, the benchmark of 8% cannot be achieved.

It can be further analyzed that when the variables reach the following range, the project IRR (after tax) can reach benchmark IRR (8%).

- Fixed Asset Investment reduce by 19.1%
- Annual O&M Cost reduce by 85.6%
- Electricity tariff increase by 19.3%
- Average Annual net electricity supplied to the grid increase by 19.3%

However, none of these variation ranges can be achieved due to the following reasons:

Fixed asset investment

From China Statistical Books, in the last few years, the *Price of Industry Products*[5], *Purchasing Price Indices for Raw Materials, Fuels and Power*[6] and *Price Indices for Investment in Fixed Assets*[7] all indicate an increasing trend. Hence, it is unlikely to decrease the fixed asset investment by 19.1%.

[5] http://www.stats.gov.cn/tjsj/ndsj/2011/html/I0915e.htm; Explanatory notes of statistical indicators refers to web address: http://www.stats.gov.cn/tjsj/ndsj/2011/html/zbe09.htm

[6] http://www.stats.gov.cn/tjsj/ndsj/2011/html/I0915e.htm; Explanatory notes of statistical indicators refers to web address: http://www.stats.gov.cn/tjsj/ndsj/2011/html/zbe09.htm

Annual O&M cost

As shown in Figure B.2, the impact of annual O&M costs on sensitivity analysis is comparatively not so significant as other three variables. If the Annual O&M Cost decreases by 85.6%, the Post-tax project IRR of the project can reach benchmark of 8%. According to the FSR, the annual O&M cost was comprised of Materials fee, Salary and Premium, Facilities repair fee and Other fees. According to the China Statistical Books, the material price has been rising in the recent years (from 2006 to 2011)[8]. Therefore, the annual operational cost won't decrease, and it is unlikely to improve the financial attraction through the decrease in annual O&M cost.

Average Annual net electricity supplied to the grid

The annual electricity output was estimated by design institute with Class A certificate on engineering design, engineering consultation and municipal engineering, based on 30 years (1982-2011) of solar radiation intensity data which comes from adjacent weather station as per approved FSR, its value will be relatively stable in conventional conditions, being unlikely to change. Furthermore, during the operation period, due to the solar cell aging and sandstorm natural condition[9], the electricity output will keep decreasing and is unlikely to increase by 19.3%, hence the IRR of the proposed project is unlikely to reach 8%.

Electricity tariff

If the Electricity tariff increases by 19.3%, the post-tax Project IRR of the project can reach benchmark of 8%. The Electricity tariff applied by the proposed project sourced from the FSR which is in accordance with the official notification on the tariff of photovoltaic power generation station "NDRC Notice for Consummating Solar Power feed-in Tariff Policy (FaGaiJiaGe [2011] No. 1594) issued by National Development and Reform Commission (NDRC) dated 2011-07-24. It indicates that the grid price for the solar projects that were approved after 2011-07-01 should implement this regulation. The project was approved on 2012-06-25, thus, the Electricity tariff for the project is 1.00 CNY/kWh (with VAT), the same with the one estimated in the FSR. Therefore, the Electricity tariff used by the IRR calculation is credible. Moreover, the electricity tariff of solar project is regulated and controlled by the central government, only adjusted when there is clear direction from NDRC as a result of a large change in power demand. By now, the only official applicable electricity tariff guidance document of solar projects is still the one mentioned above which was published on 2011-07-24. Therefore, an increase of 19.3% in the electricity tariff is highly unlikely, and as such, the IRR is not likely to reach the 8% benchmark.

Outcome of step 2

The results of the above analysis indicate that the project faces significant economic and financial barriers without CDM revenue.

Step 3 Barrier Analysis

N/A

Outcome of step 3

N/A

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[7] http://www.stats.gov.cn/tjsj/ndsj/2011/html/I0916e.htm; Explanatory notes of statistical indicators refers to web address: http://www.stats.gov.cn/tjsj/ndsj/2011/html/zbe09.htm

[8] http://www.stats.gov.cn/tjsj/ndsj/2011/html/I0915e.htm; Explanatory notes of statistical indicators refers to web address: http://www.stats.gov.cn/tjsj/ndsj/2011/html/zbe09.htm http://219.235.129.58/reportView.do?Url=/xmlFiles/537f58646d9e4ab2afbde90a383c0702.xml&id=42a2b066af9a464282c370d7c7e07ec2&bgqDm=20111000

[9] The proposed project located in desert area, hence the sandstorm will greatly accelerate the solar cell aging and impact the solar cell conversion efficiency, and then reduce the electricity output.

Step 4 Common Practice Analysis

According to the Guidelines on common practice (Ver02.0, EB69 Annex08), the common practice is analyzed as follow,

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

The applicable output range of the proposed project activity is 10 MW to 30MW.

Step 2: identify similar projects (both CDM and non-CDM) which fulfill all of the following conditions:

(a) The projects are located in the applicable geographical area;
(b) The projects apply the same measure as the proposed project activity;
(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;
(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;
(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;
(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.

Identification is as follow,

(a) The common practice analysis is limited to the provincial level as the investment environment for each province is different. In Xinjiang Uygur Autonomous Region, with an area of 1,600,000 km^2, the Provincial Government is responsible for making the taxes, loan and electricity tariff policies, etc. that are applicable specifically to the Province. In addition, installed capacity, construction permit, operation control and electricity supply in the Xinjiang Uygur Autonomous Region are organized and regulated by the relevant office of Xinjiang government. Besides the different tax and electricity tariff, there are still a lot of other differences in each province.

(b) As the project is a green-field solar power project, the same measures belong to measure (b) Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies (example: energy efficiency improvements, power generation based on renewable energy);

(c) As the project is a green-field solar power project, hence the projects should use solar energy source;

(d) As the project produces grid-connected power, so the Similar projects should be the grid-connected power generation based on renewable energy;

(e) The applicable output range of the proposed project activity is 10MW to 30MW;

(f) As the project starting date is 2012-11-12, and the PDD GSP date was 2012-07-18, hence the projects should start commercial operation before 2012-07-18.

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}.

Thus, we selected the solar projects operated before 2012-07-18, with an installed capacity of between 10MW and 30MW in Xinjiang Uygur Autonomous Region as "N_{all}". Projects have been applied to CDM were excluded.

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

As the Power System Reform Blue Print, published by State Council on February 10, 2002, and after then, the power policy changed, in addition, the project starting date was determined as 2012-07-18, hence, the project operated before 2002 is defined as different technology. Hence, the time range for the similar projects is operated after 2002 and before 2012-07-18.

Through checking the public information[10], till 2012-07-18, there are no solar power plants with an installed capacity of between 10MW and 30MW in Xinjiang Uygur Autonomous Region that have not applied for CDM projects, so number $N_{diff}=N_{all}=0$.

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.

$F=1-N_{diff}/N_{all}=0$

The proposed project activity is a common practice within a sector in the applicable geographical area if the factor F is greater than 0.2 and $N_{all}-N_{diff}$ is greater than 3.

$F=0<0.2$ and $N_{all}-N_{diff}=0<3$, so the proposed activity is not a common practice within a sector in the applicable geographical area.

Outcome of step 4

Based on the common practice analysis above, it is confirmed that the project is not a common practice.

Summary

The project faces investment barrier which would prevent the implementation of the proposed project activity without CDM. CDM helps to overcome these barriers. If the project could not be implemented, the equivalent electric power would be supplied by the NWCPG, which is highly dependent on fossil fired power plants, leading higher GHG emissions. Hence, this specific project activity isn't baseline scenario, and it is additional.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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As per ACM0002 and *Notice on 2011 Baseline Emission Factors for Regional Power Grids in China*[11] are applied as the following steps:

I. Calculating the Baseline Emissions（BE_y）

II. Calculating the Project Emissions（PE_y）

III. Calculating the Emission Reductions（ER_y）

[10] China Wind Power and Solar Photovoltaic Industry Association (http://cwpva.org/html/taiyangnenjishu/index.html) and China Electricity Power Yearbook 2011

[11] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf

I. Calculating the Baseline Emissions（BEy）

The baseline scenario of the project is: electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and addition of new generation sources. The baseline emissions calculated as follows:

$$BE_y = EG_{PJ,\mathrm{y}} \times EF_{grid,CM,y} \quad \text{(Equation B.1)}$$

Where:

BE_{y} = Baseline emissions in year y (tCO_2e)

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

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1) (tCO_2e/MWh)

The project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, according to the methodology ACM0002 (version 13.0.0),

$$EG_{PJ,\mathrm{y}} = EG_{facility,,y} \quad \text{(Equation B.2)}$$

Where:

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

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

According to the methodology ACM0002(Version 13.0.0), $EG_{facility,y}$ is the quantity of net electricity generation supplied by the project plant/unit to the grid. It shall be determined as a difference between (i) quantity of electricity supplied by the project plant/unit to the grid and quantity of electricity delivered to the project plant/unit from the grid.

For this project $EG_{facility,y}=EG_{export,y} - EG_{import,y}$
Of which:
$EG_{export,y}$ = quantity of electricity supplied by the project plant to the grid in year y.
$EG_{import,y}$ = electricity delivered to the project plant from the grid in year y.

According to ACM0002 (Version 13.0.0), the calculation of emission factor should use the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1). The CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system is determined by calculating the "operating margin" (OM) and "build margin" (BM) as well as the "combined margin" (CM).

The tool provides procedures to determine the following parameters:

Parameter	SI Unit	Description

$EF_{grid,CM,y}$	tCO_2e/MWh	Combined margin CO_2 emission factor for grid connected power generation in year *y*
$EF_{grid,BM,y}$	tCO_2e/MWh	Build margin CO_2 emission factor for grid connected power generation in year *y*
$EF_{grid,OM,y}$	tCO_2e/MWh	Operating margin CO_2 emission factor for grid connected power generation in year *y*

Project participants shall apply the following six steps:

STEP 1. Identify the relevant electricity system.
STEP 2. Choose whether to include off-grid power plants in the project electricity system
STEP 3. Select a method to determine the operating margin (OM).
STEP 4. Calculate the operating margin emission factor according to the selected method.
STEP 5. Calculate the build margin (BM) emission factor.
STEP 6. Calculate the combined margin (CM) emissions factor.

Step 1. Identify the relevant electricity system.

As described in B.3 above, the electricity displaced by the proposed project should be the electricity generated by NWCPG. Therefore, NWCPG is identified as the relevant electric power system. And the Chinese DNA has also published a delineation of the project electricity system and the connected electricity system.

According to the Chinese DNA guidance[12], NWCPG is composed of Shaanxi Power Grid, Gansu Power Grid, Qinghai Power Grid, Ningxia Power Grid and Xinjiang Power Grid. NWCPG is then defined in the proposed project boundary.

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

The methodological tool for calculating operating margin and build margin emission factors provides two options:

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.

As this project is grid power plants, option I is chose to calculate emission factor.

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

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

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

According to the *Tool to calculate the emission factor for an electricity system* (version 02.2.1), the simple OM method (option a) can only be used if low-cost/ must- run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

[12] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf

The low-cost must run resources constitute less than 50% of total grid generation in NWCPG, the percentage of the low-cost must run resources in the recent 5 years are: 27.46% in 2005, 24.69% in 2006, 22.43% in 2007 and 21.82% in 2008, 24.41% in 2009[13], which accords with the defined condition of method (a), but not method (d). Consequently, Simple OM method is selected to calculate the Operating Margin emission factor of the proposed project.

On the other hand, among these methods, dispatch analysis, cannot be used, because dispatch data, let alone detailed dispatch data, are not available to the public or to the project participants. For the same reason, the simple adjusted OM methodology cannot be used. The average OM does not take into account the non- dispatchable nature of low-cost/must-run resources and as low-cost/must-run resources constitute less than 50% of total grid generation, we have selected the Simple OM method as the most appropriate method.

In accordance with the 'Tool to calculate the emission factor for an electricity system', the OM is calculated according to the '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.

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 CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units.

The simple OM may be calculated:

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

We calculate the OM emission factor according to Option B of the Simple OM method, as data required for Option A is not available to the public or to the project participants. Where Option B is used, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i \left(FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y} \right)}{EG_y} \qquad \text{Equation (B.3)}$$

Where:

$EF_{grid,OMsimple,y}$: Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$FC_{i,y}$: Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i,y}$: Net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$: CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
EG_y: Net electricity generated and delivered to the grid by all power sources serving the system, not

[13] Data source: China Electric Power Yearbook 2006-2010.

including low-cost/ must-run power plants/unit, in year *y* (MWh)

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

y: The relevant years as per the data vintage chosen in Step 3.

Choice of aggregated data sources

The published OM emission factor calculates the emission factor directly from published aggregated data on fuel consumption, net calorific values, and power supply to the grid and IPCC default values for the CO_2 emission factor.

Calculation of the OM emission factor as a three-year full generation weighted average

On the basis of these data, the Operating Margin emission factors for 2007, 2008 and 2009 are calculated. The three-year average is calculated as a full-generation-weighted average of the emission factors. For details we refer to the publications cited above and the detailed explanations and demonstration of the calculation of the OM emission factor provided in Appendix 4. The Operation Margin Emission Factor is calculated as $EF_{grid,OMsimple,y} = 1.0001 tCO_2e/MWh$.

The calculation of the OM emission factor is done once (*ex ante*) and will *not* be updated during the first crediting period. This has the added advantage of simplifying monitoring and verification of emission reductions.

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

The Build Margin emission factor $EF_{BM,y}$ is calculated ex-ante based on the most recent information available on plants already built for sample group *m* at the time of PDD submission.

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

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

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% 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 ($AEG_{SET\text{-}\geq 20\%}$, in MWh);

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

It is very difficult to obtain the data of the five power units started to supply electricity to the grid most recently because these data are considered as confidential business matter in China. So, $SET_{\geq 20\%}$ is selected as SET_{sample}. Based on relevant data released by Chinese DNA, none of the power units in the selected SET_{sample} started to supply electricity to the grid more than 10 years ago. Hence the selected SET_{sample} is used to calculate the build margin.

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{\text{grid},BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \qquad \text{Equation (B.4)}$$

Where:

$EF_{grid,BM,y}$: Build margin CO_2 emission factor in year y (CO_2/MWh)
$EG_{m,y}$: Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$: CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m : Power unit include in the build margin
y :Most recent historical year for which power generation data is available

The sample m, according to the methodology, should be over the latest 5 power plants added to the grid, or over the last added power plants accounting for at least 20% of power generation. We apply an indirect approach based on the EB decision[14] as mentioned in step 4.

First we calculate the newly–added installed capacity and the share of each power generation technology in the total capacity. Second, we calculate the weights of each power generation technology in the newly-added installed capacity. Third, emission factors for each fuel group are calculated on the basis of an advanced efficiency level for each power generation technology and a weighted average carbon emission factor on the basis of IPCC default carbon emission factors of individual fuels.

Since the exact data are aggregated, the calculation will apply the following method: We calculate the share of the CO_2 emissions of solid fuel, liquid fuel and gas fuel in total emissions respectively by using the latest energy balance data available; the calculated shares are the weights.

Using the emission factor for advanced efficient technology we calculate the emission factor for thermal power; the BM emission factor of the power grid will be calculated by multiplying the emission factor of the thermal power with the share of the thermal power in the most recently added 20% of total installed capacity.

Detailed steps and formulas are as below:

Calculate the share of CO_2 emissions of the solid, liquid and gaseous fuels in total emissions respectively.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}} \qquad \text{Equation (B.5)}$$

$$\lambda_{Oil} = \frac{\sum_{ieOIL,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}} \qquad \text{Equation (B.6)}$$

$$\lambda_{Gas} = \frac{\sum_{ieGAS,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}} \qquad \text{Equation (B.7)}$$

[14] This is in accordance with the "Request for guidance: Application of AM0005 and AMS-I.D in China", a letter from DNV to the Executive Board, dated 07/10/2005, available online at: http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM.

Where:
λ_{Coal}, λ_{Oil} and λ_{Gas} respectively refers to weights of CO_2 emissions of solid, liquid and gas fuel in total emissions; *Coal, Oil and Gas* respectively refers to the group of solid, liquid, and gas fuels;
$FC_{i,m,y}$ is the amount of fuel *i* consumed in province *m* in year *y*;
$NCV_{i,y}$ is the net calorific value (energy content) of fossil fuel *i* in year *y*;
$EF_{CO2,i,y}$ is the CO_2 emission factor of fossil fuel *i* in year *y*.

For the detailed information, please see the Appendix 4.

Calculation of Emission Factor of Relevant Thermal Power

The emission factor of thermal is then calculated by using a formula as follows:

$$EF_{Thermal,adv} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad \text{Equation (B.8)}$$

Where:
$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ respectively refers to the emission factor representing best technology commercially available for fuel of coal, oil or gas fired power plants.
λ_{Coal}, λ_{Oil} and λ_{Gas} respectively refers to the weighing of capacity additions for fuel of coal, oil or gas fired power plants.

Calculate BM of the power grid:

The calculation of the BM is based on the results above and the weighing of thermal power of recent 20% capacity additions.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad \text{Equation (B.9)}$$

Where:
CAP_{Total} is the total of new capacity additions;
$CAP_{Thermal}$ is the new capacity addition of thermal power.

The calculation of the BM emission factor is done once (*ex ante*) and will *not* be updated during the first crediting period. This has the added advantage of simplifying monitoring and verification of emission reductions. For details we refer to the publications cited above and the detailed explanations and demonstration of the calculation of the BM emission factor provided in Appendix 4. The Build Margin Emission Factor is calculated as $EF_{grid,BMsimple,y}$ = 0.5851tCO_2e/MWh.

Step 6. Calculate the combined margin emission factor

The Baseline Emission Factor is calculated as a Combined Margin, using a weighted average of the Operating Margin and Build Margin

To calculate $EF_{grid,CM,y}$ with the combined margin (CM), the following equation is used:

$$EF_{grid,CM,y} = w_{OM} \times EF_{grid,OM,y} + w_{BM} \times EF_{grid,BM,y} \quad \text{Equation (B.10)}$$

Where:

$EF_{grid,BM,y}$: Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$: Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM}: Weighting of operating margin emissions factor (%)
w_{BM}: Weighting of build margin emission factor (%)

According to the *2011 Baseline Emission Factors for Regional Power Grids in China* renewed by Director Office of National Climate Change Coordination of Chinese DNA on October. 20, 2011, the Operating Margin Emission Factor ($EF_{grid,OM,y}$) of the NWCPG is **1.0001tCO$_2$e/MWh** and the Build Margin Emission Factor ($EF_{grid,BM,y}$) is **0.5851tCO$_2$e/MWh.** The defaults weights value for waste energy recovery projects during the first crediting period are used as specified in the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1).

$$w_{OM} = 0.75 ; w_{BM} = 0.25$$

Using above mentioned values the Combined Baseline Emission Factor of the NWCPG corresponds to **0.89635tCO$_2$e/MWh.**

The calculation of the CM emission factor is done once (*ex ante*) and will *not* be updated during the first crediting period.

II. Calculating the Project Emissions（PEy）

According to the methodology, there are no expected project emissions for a solar power project.
Therefore, $PE_y = 0$.

III. Calculating the Emission Reductions（ER_y）

Emission reductions will be estimated based on the baseline emission, the project emission and the leakage emission. The emission reduction ER_y due to the project activity during a given year y is calculated as follows:

$$ER_y = BE_y - PE_y \quad \text{Equation (B.11)}$$

Based on formula (B.1),(B.2) and (B.11),

$$ER_y = EG_{facility,y} \times EF_{grid,CM,y} \quad \text{Equation (B.12)}$$

Where $EG_{facility,y} = EG_{export,y} - EG_{import,y}$ Equation (B.13)

Therefore, the emission reductions are equal to the baseline emissions, namely,

$$ER_y = BE_y = EG_{facility,y} \times EF_{grid,CM,y} = (EG_{export,y} - EG_{import,y}) \times EF_{grid,CM,y} \quad \text{Equation (B.14)}$$

B.6.2. Data and parameters fixed ex ante

Data / Parameter	$FC_{i,y}$
Unit	10^4t, 10^7m^3
Description	Amount of fossil fuel type *i* (in a mass or volume unit) consumed in NWCPG in year *y*
Source of data	*China Energy Statistical Yearbook 2008-2010*
Value(s) applied	Refer to Appendix 4 for details
Choice of data or Measurement methods and procedures	Data that is collected from the Chinese official statistics.
Purpose of data	Used for baseline emission calculation
Additional comment	Official data

Data / Parameter	$EF_{CO2,i,y}$
Unit	kgCO_2/TJ
Description	CO_2 emission factor of fossil fuel type *i* in year y
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories ,Volume 2 Energy
Value(s) applied	Refer to Appendix 4 for details
Choice of data or Measurement methods and procedures	Data that is collected from the IPCC because the local data is not available.
Purpose of data	Used for baseline emission calculation
Additional comment	Official data

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	China Energy Statistical Yearbook 2008-2010
Value(s) applied	Refer to Appendix 4 for details
Choice of data or Measurement methods and procedures	Data that is collected from the Chinese official statistics.
Purpose of data	Used for baseline emission calculation
Additional comment	Official data

Data / Parameter	*CAP*
Unit	MW
Description	Installed capacities of NWCPG
Source of data	China Electric Power Yearbook 2008-2010
Value(s) applied	Refer to Appendix 4 for details
Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Used for baseline emission calculation
Additional comment	Official data

Data / Parameter	EG_y
Unit	MWh
Description	Net electricity generated and delivered to NWCPG in year *y*
Source of data	China Electric Power Yearbook, 2008-2010
Value(s) applied	Refer to Appendix 4 for details
Choice of data or Measurement methods and procedures	Data that is collected from the Chinese official statistics.
Purpose of data	Used for baseline emission calculation
Additional comment	Official data

Data / Parameter	*Auxiliary Power Ratio*
Unit	%
Description	The auxiliary power ratio of source *j* in NWCPG
Source of data	China Electric Power Yearbook 2008-2010
Value(s) applied	Refer to Appendix 4 for details
Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Used for baseline emission calculation
Additional comment	Official data

Data / Parameter	$EF_{Coal,\ Adv}$
Unit	%
Description	The fuel consumption rate of coal-fired power plants which are applied by the most advanced commercialized technologies.
Source of data	China DNA
Value(s) applied	39.45%
Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Used for baseline emission calculation
Additional comment	Official data

Data / Parameter	$EF_{Oil,\ Adv}$
Unit	%
Description	The fuel consumption rate of Oil-fired power plants which are applied by the most advanced commercialized technologies.
Source of data	China DNA
Value(s) applied	51.77%
Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Used for baseline emission calculation
Additional comment	Official data

Data / Parameter	$EF_{Gas,\ Adv}$
Unit	%
Description	The fuel consumption rate of Gas-fired power plants which are applied by the most advanced commercialized technologies.
Source of data	China DNA
Value(s) applied	51.77%
Choice of data or Measurement methods and procedures	Data that is collected from the official statistics.
Purpose of data	Used for baseline emission calculation
Additional comment	Official data

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"
Source of data	http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf
Value(s) applied	0.89635
Choice of data or Measurement methods and procedures	As per the "Tool to calculate the emission factor for an electricity system."
Purpose of data	Used for baseline emission calculation
Additional comment	Official data

B.6.3. Ex-ante calculation of emission reductions

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I. Baseline emission

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

$EF_{grid,CM,y}$ =0. 89635 tCO_2e/MWh.

According to the Feasibility Study Report of the proposed project, the estimated annual electricity generation delivered to the power grid is as follows, so the baseline emission BE_y is identified.

Year	Estimation of electricity supplied to the grid (MWh)	$EF_{grid,CM,y}$ (t CO_2e/MWh)	Estimation of Baseline emissions (t CO_2e)
0112/2013-30/11/2014	30626.66	0.89635	27,452
01/12/2014-30/11/2015	30626.66	0.89635	27,452
01/12/2015-30/11/2016	30626.66	0.89635	27,452
01/12/2016-30/11/2017	30626.66	0.89635	27,452
01/12/2017-30/11/2018	30626.66	0.89635	27,452
01/12/2018-30/11/2019	30626.66	0.89635	27,452
01/12/2019-30/11/2020	30626.66	0.89635	27,452

II. Project Emission

According to the methodology, there are no expected project emissions for a solar power project. Therefore, $PE_y = 0$.

III. Estimate emission reductions

The Emission Reductions (ER_y) for the project activity could be calculated as the formula (11):

$$ER_y = BE_y - PE_y$$

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

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
0112/2013-30/11/2014	27,452	0	0	27,452
01/12/2014-30/11/2015	27,452	0	0	27,452
01/12/2015-30/11/2016	27,452	0	0	27,452
01/12/2016-30/11/2017	27,452	0	0	27,452
01/12/2017-30/11/2018	27,452	0	0	27,452
01/12/2018-30/11/2019	27,452	0	0	27,452
01/12/2019-30/11/2020	27,452	0	0	27,452
Total	192,164	0	0	192,164
Total number of crediting years	7			
Annual average over the crediting period	27,452	0	0	27,452

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	$EG_{export,y}$
Unit	MWh
Description	Quantity of electricity supplied by the project plant to the grid in year y
Source of data	Measured by meter
Value(s) applied	The average power supplied to the grid by the project is estimated to be 30626.66MWh
Measurement methods and procedures	Measured continuously and recorded on a monthly basis
Monitoring frequency	Continuous measurement and monthly recording
QA/QC procedures	The meters will be annually calibrated according to the relevant national electric industry standards and regulations; power supplied to the grid will be double checked according to sales invoices.
Purpose of data	Baseline Emission calculation
Additional comment	Refer to B.7.3. Description of the monitoring plan The data is to be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter	$EG_{import,y}$
Unit	MWh
Description	Electricity delivered to the project plant from the grid in year y
Source of data	Measured by meter
Value(s) applied	0MWh
Measurement methods and procedures	Measured continuously and recorded on a monthly basis

Monitoring frequency	Continuous measurement and monthly recording
QA/QC procedures	The meters will be annually calibrated according to the relevant national electric industry standards and regulations; electricity use of power plant supplied by the grid will be double checked according to purchasing invoices.
Purpose of data	Baseline Emission calculation
Additional comment	Refer to B.7.3. Description of the monitoring plan. The data is to be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter	$EG_{facility,y}$
Unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data	Electricity meter(s) Calculated as $EG_{facility,y} = EG_{export,y} – EG_{import,y}$
Value(s) applied	30626.66MWh
Measurement methods and procedures	The following parameters shall be measured: (i) The quantity of electricity supplied by the project plant/unit to the grid $EG_{export,y}$; and (ii) The quantity of electricity delivered to the project plant/unit from the grid $EG_{import,y}$
Monitoring frequency	Continuous measurement and monthly recording
QA/QC procedures	/
Purpose of data	Baseline Emission calculation
Additional comment	The data is to be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

B.7.2. Sampling plan

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No data and parameters monitored in the section B.7.1 above is determined by a sampling approach.

B.7.3. Other elements of monitoring plan

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The monitoring plan is compiled in accordance with the requirements of ACM0002 (version13.0.0), the purpose of which is to ensure the completeness, consistency, accuracy of the monitoring and calculation for the emission reductions.

1. Monitoring management structure

In order to obtain effective monitored data, the project owner will establish a CDM Monitoring Office and designate qualified staffs responsible for all relevant matters, including monitoring, data collection and archiving, QC/QA, and verification. The structure of the CDM Monitoring Office is outlined in Figure B–3.

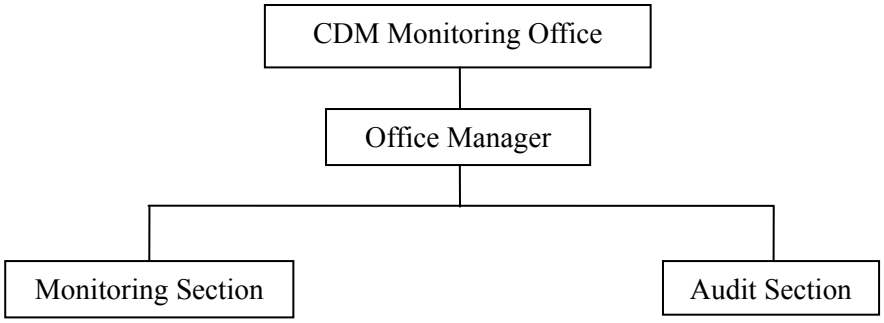

Figure B-3 Organization Chart of the CDM Project Management Office

The responsibilities of the sections are briefly described as following:

- Office Manager: Manage the work of CDM Monitoring Office; Charge of all relevant matters with the monitoring activity.
- Monitoring Section: Monitor, collect and archive the data according to the Monitoring and Management Manual.
- Audit Section: Audit the work of Monitoring Section and execute the QC/QA procedures according to the Monitoring and Management Manual.

2. Calibration of Meters & Metering

The meters will be properly installed and maintained according to the requirement from Technical Administrative Code of Electric Energy Metering (DL/T448-2000). The meters' accuracy is no less than 0.5, and will be calibrated once a year. All the records should be documented and maintained by the project owner for DOE's verification.

3. Monitor

The readings of meters will be used for calculating the emission reductions. The main meter will be installed at the connected point between the proposed project and power grid, this meter measures the power supplied to the grid and the electricity use of power plant supplied by the grid. And a backup meter will be installed in the same place with the main meter.
If inaccuracy of the reading data from the main meter exceeds the allowable tolerance or otherwise the meter malfunctioned will operate in one month, the grid-connected electricity generated by the proposed project shall be followed by:

i the meter readings form backup meter; and
ii If the backup meter is still in malfunction, the ER during the period of meter broken will not be claimed.

The meter reading shall be readily accessible for the DOE. Calibration test records shall be maintained for verification.

4. Data collection and management system

The project owner and the Grid Company are responsible for monitoring equipment, and guarantee the measuring equipments are in good operation.

The electricity recorded by the main meter alone will suffice for the purpose of invoices and emission reduction verification as long as the accuracy of the main meter is within the permissible tolerance. The revenue monitoring process is as follows:

i The project owner and the Grid Company read and check the main meter, and records the data on an appointed day of every month;
ii The grid Company supplies the electricity reading to the project owner;
iii The project owner provides electricity sales invoices to the Grid Company. A copy of the invoices is stored by the project owner, together with a record of the payment by the grid company;
iv The Grid Company provides electricity sales invoices to the project owner based on the electricity use of power plant supplied by the grid company, and the invoices are stored by the project owner;
v The project owner records the net electricity supplied to the grid;
vi The project owner keeps and safeguards the records of the main meter's data readings for verification by the DOE.

Data will be archived at the end of each month using electronic spreadsheets. The electronic files will be stored on hard disk and CD-ROM. In addition, a hard copy printout will be archived. Physical documentation such as, paper-based maps, diagrams and environmental assessment, will be collected in a central place, together with the monitoring plan. In order to facilitate the auditor's reference, monitoring results will be indexed. All electronic information will be stored by the project owner. The data is to be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

5. Quality Assurance and Quality Control

The project activities will use high-precision monitoring equipment to monitor the electricity to the grid. All meters will be calibrated and sealed as per the industry practices at regular intervals. Hence, high quality is ensured. Electricity sales invoices will be used to test the consistency of the recorded data.

Calibration of Meters & Metering should be implemented according to national standards and rules. For the project, the meter calibration frequency will be once a year. All the records should be documented and maintained by the project owner for DOE's verification.

6. Verification

The main objective of the verification is to independently verify that the proposed project has achieved the emission reductions as reported.

The proposed project owner has the responsibility to provide any necessary data, information and document required by DOE during the certification process.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>

12/11/2012 (Starting date of the project activity when the Road Construction Contract signed)

C.1.2. Expected operational lifetime of project activity

>>

20 years and 0 month

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>

The renewable crediting period will be applied.

C.2.2. Start date of crediting period

>>

01/12/2013 or registration date whichever is later

C.2.3. Length of crediting period

>>

7 years and 0 month

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>

According to the relevant environmental law and regulations, an environmental impact assessment has been carried out, and the assessment report has been approved by the Xinjiang Environmental Protection Bureau on 2012-05-03. The main assessment conclusions are as follows:

- **Noise Impact on the Environment**

Noise will be generated by machine equipment and vehicle during the construction period. Measures will be taken to reduce the environmental impacts of noise: choosing low-noise machines and technologies, strengthening the management and maintenance on equipment, allocate reasonable selection and layout on the plant construction site, and enhancing construction management etc.

- **Impact of solid waste on environment**

During the construction period, the discharged waste slag will be reduced by refilling the excavated earth as much as possible, and the wastes will be piled up in designated waste disposal sites.
During the operation period, the domestic waste produced by operational workers will be collected and discharged by existing garbage disposal facilities.

- **Impact on the water environment**

The main water pollution includes industrial wastewater and domestic wastewater.
During the construction period, the domestic wastewater will be discharged through local sewage treatment facilities. For the applied mechanical equipment is relative less, so the industrial wastewater will be also less, in addition, the industrial wastewater can be used to irrigate plant.
During the operation period, domestic wastewater will be treated by a septic tank, so the wastewater after treatment could well satisfy the requirement of Chinese Environmental Standard, which will be collected into a water collection basin for greening and so on. After those appropriate treatment measures has been taken, such wastewater will not cause negative impacts on the environment.

- **Impact on the Air quality**

The main air pollution sources during the construction period include excavation, blasting and transportation, and the main air pollutant is dust. Some measures will be taken to reduce impact of dust, such as watering, covering and the construction material will be pile up centralized. Therefore, the construction has little negative impact on the local air environment.

- **Impact on ecological environment**

In order to protect the environment, the following measures will be taken: pouring concrete and backfilling after foundation ditch excavated; rolling and compacting the surface layer in order to protect the vegetation and reduce dust; carrying away all waste slag and cleaning up the construction site to recover the original vegetation when the construction is over.
There is no rare plant and wild animal living around the project site, nor the inhabitant of birds. Therefore, the proposed project activity has little negative influence on birds and ecological environment.

D.2. Environmental impact assessment

The Environmental Impacts Assessment of the Project indicates that the operation of the Project will discharge almost no wastewater or air pollutants to the local environment.
From above statement, it is safe to conclude that the environmental impacts of the Project are minor, and the Project is definitely an environment friendly way of providing power.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

The project developer invited the comments of local stakeholders by issuing questionnaires. Hami Tianrun New Energy Co., Ltd. carried out the survey on the local residents and the representative of government officials in Jun. 2012.

The investigation has taken full account into the public advice of different ages, education levels and occupations.

The survey was conducted through distributing and collecting responses to a questionnaire which was designed by project developer.

1) Project introduction

2) Respondent's basic information

3) Questions on:

- What level do you know about the proposed project?
- Do you know about the Clean Development Mechanism?
- Do you think which impact on the environment may be caused by the project?
- What kind of impact on local environment may be caused by the project?
- What impacts on your life may be caused by the project?
- What kind of impact on local economic development may be caused by the project?
- Whether to support the construction of the project?
- Other suggestions

4) Space for the respondents' signature and date.

Questionnaires have been distributed according to the principle of both representation and randomness in order to reflect the public opinions and comments in a fair and real manner.

The investigation has taken full account into the public advice of different ages, education levels and occupations.

E.2. Summary of comments received

>>

Total 50 questionnaires were distributed, all of the distributed questionnaires had been returned. All of the opinions from the local stakeholders had been collected and considered. Detailed information of respondents lists as follows：

No.	Items	Range	Numbers(Person)	Ratio (%)
1	Age	~30	15	30%
		31~40	25	50%
		40~	10	20%
2	Education level	elementary school	6	12%
		junior high school	12	24%
		senior high schoolor secondary	18	36%

		technical school		
		college	14	28%
3	Career	Worker	18	36%
		Government official	12	24%
		Peasant、Resident and individual operation	20	40%

Summary of the survey：

Comments from the returned questionnaires show that 100% of the investigated stakeholders agree with the project construction, and none of them objects.

100% of the investigated stakeholders know something about the project;

80% of them know something about CDM while 20% of them don't know about it;

100% of them think that the project will not bring negative impact to local environment;

100% of them think that the construction of the project will bring positive impact to local environment;

As for the impact for local people's life, 74% of them think the construction of proposed project could guarantee the supplement of electricity, 68% of them think it could increase job opportunity, 60% of them think it could increase family income, 18% of them think it could improve local air quality;

100% of them think it will promote the development of local economy and society;

100% of them support the construction of the project;

All the stakeholders are supportive of this project.

E.3. Report on consideration of comments received

>>

As stated above, the public survey showed that the project activity is supported by local stakeholders and has positive impact on various aspects. No negative impacts will be caused by the project. Therefore, measures to address adverse impacts are not necessary.

SECTION F. Approval and authorization

>>

The LOA from China and Switzerland for the proposed project is not available at the time of submitting the PDD to the validating DOE.

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Appendix 1: Contact information of project participants

Organization	Hami Tianrun New Energy Co., Ltd.
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State/Region	
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Website	
Contact person	Cheng Pei-Jie
Title	Project Manager
Salutation	Mr.
Last name	Cheng
Middle name	
First name	Pei-Jie
Department	Investment Dept.
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Personal e-mail	chengpeijie@tianrun.cn

Organization name	Vitol S.A.
Street/P.O. Box	28 Boulevard du Pont-d'Arve
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Contact person	David Fransen
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Personal e-mail	carbonproject@vitol.com

Appendix 2: Affirmation regarding public funding

No public funding from Annex I parties are involved in this project activity.

Appendix 3: Applicability of selected methodology

No further information on the applicability of the selected methodology is available.

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

The project refers to the *2011 Baseline Emission Factors for Regional Power Grids in China* that is published by the National Development and Reform Committee of China (Chinese DNA) on 20/10/2011 for the OM and BM emission factors of the Northwest Power Grid (NWCPG). In the reference, emission factors of NWCPG are calculated based on the approved *"Tool to calculate the emission factor for an electricity system"*. The $EF_{grid,CM,y}$, $EF_{grid,OM,y}$, and $EF_{grid,BM,y}$ of Northwest Power Grid (NWCPG) could be calculated as following:

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

Option (C) was chosen to calculate the Operating Margin Emission Factor ($EF_{grid,OM,y}$) as bellows:

Table 1 Electricity Generation of NWCPG in 2007

Province name	Electricity generation of fuel-fired power plants（MWh）	Auxiliary power ratio（%）	Total Electricity Supplied to the Grid（MWh）
Shaanxi	59,100,000	6.77	55,098,930
Gansu	42,400,000	5.89	39,902,640
Qinghai	9,700,000	7.19	9,002,570
Ningxia	43,500,000		43,500,000
Xinjiang	34,600,000	9.2	31,416,800
Total			**178,920,940**

Sources: China Electric Power Yearbook 2008

Table 2 Electricity Generation of NWCPG in 2008

Province name	Electricity generation of fuel-fired power plants（MWh）	Auxiliary power ratio（%）	Total Electricity Supplied to the Grid（MWh）
Shaanxi	71,500,000	6.95	66,530,750
Gansu	46,800,000	6.4	43,804,800
Qinghai	10,700,000	7.14	9,936,020
Ningxia	44,000,000	7.57	40,669,200
Xinjiang	39,700,000		39,700,000
Total			**200,640,770**

Sources: China Electric Power Yearbook 2009

Table 3 Electricity Generation of NWCPG in 2009

Province name	**Electricity generation of fuel-fired power plants（MWh）**	**Auxiliary power ratio（%）**	**Total Electricity Supplied to the Grid（MWh）**
Shaanxi	**77,400,000**	**7.24**	**71,796,240**
Gansu	**44,100,000**	**6.88**	**41,065,920**
Qinghai	**10,700,000**	**7.01**	**9,949,930**
Ningxia	**44,700,000**	**7.76**	**41,231,280**
Xinjiang	**45,200,000**	**5.16**	**42,867,680**
Total			**206,911,050**

Sources: China Electric Power Yearbook 2010

Table 4 Calculating CO_2 Emission of NWCPG in 2007

Fuel	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total	Emission factor (tC/TJ)	OXID (%)	Fuel emission factor ($kgCO_2/TJ$)	NCV ($MJ/t,m^3$)	CO_2 Emission (tCO_2e)
		A	**B**	**C**	**D**	**E**	**F=A+B+…+E**	**G**	**H**	**I**	**J**	**K=F×I×J/100000 (quality unit); K=F×I×J/10000 (volume unit)**
Raw Coal	10^4t	3303.44	1969.03	470.85	2165.8	1762.11	**9671.23**	25.8	100	87,300	20,908	176,525,905
Cleaned coal	10^4t						**0**	25.8	100	87,300	26,344	0
Other Washed Coal	10^4t	3.73			124.31	7.73	**135.77**	25.8	100	87,300	8,363	991,243
		3.53					**3.53**	26.6	100	87,300	20,908	64,432
Coke	10^4t						**0**	29.2	100	95,700	28,435	0
Coke Oven Gas	10^8m^3	0.52	0.65			0.26	**1.43**	12.1	100	37,300	16,726	89,215
Other Gas	10^8m^3	14.14	0.71				**14.85**	12.1	100	37,300	5,227	289,526
Crude Oil	10^4t					0.09	**0.09**	20	100	71,100	41,816	2,676
Gasoline	10^4t	0.02					**0.02**	18.9	100	67,500	43,070	581
Diesel Oil	10^4t	1.12	0.26	0.42		1.77	**3.57**	20.2	100	72,600	42,652	110,546
Fuel Oil	10^4t	0.01	1.05	0.04		0.05	**1.15**	21.1	100	75,500	41,816	36,307
LPG	10^4t						**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^4t					5.99	**5.99**	15.7	100	48,200	46,055	132,969
Natural Gas	10^8m^3	1.68	0.49	1.93		8.66	**12.76**	15.3	100	54,300	38,931	2,697,404
Other Petroleum Products	10^4t						**0**	20	100	72,200	41,816	0
Other Coking Products	10^4t						**0**	25.8	100	95,700	28,435	0
Other Energy	10^4tce	94.36	9.73				**104.09**	0	0	0	0	0
Total												**180,940,805**

Sources: China Energy Statistical Yearbook 2008

Table 5 Calculating CO_2 Emission of NWCPG in 2008

Fuel	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total	Emission factor (tC/TJ)	OXID (%)	Fuel emission factor ($kgCO_2/TJ$)	NCV ($MJ/t,m^3$)	CO_2 Emission（tCO_2e）
		A	**B**	**C**	**D**	**E**	**F=A+B+…+E**	**G**	**H**	**I**	**J**	**K=F×I×J/100000 (quality unit); K=F×I×J/10000 (volume unit)**
Raw Coal	10^4t	3620	2216.9	507.44	2330.72	1924.9	**10599.96**	25.8	100	87,300	20,908	193,477,720
Cleaned coal	10^4t						**0**	25.8	100	87,300	26,344	0
Other Washed Coal	10^4t	9.22			53.85	8.2	**71.27**	25.8	100	87,300	8,363	520,335
Briquettes	10^4t						**0**	26.6	100	87,300	20,908	0
Coke	10^8m^3						**0**	29.2	100	95,700	28,435	0
Coke Oven Gas	10^8m^3	0.35	0.74			0.13	**1.22**	12.1	100	37,300	16,726	76,113
Other Gas	10^4t	18.38	0.2				**18.58**	12.1	100	37,300	5,227	362,249
Crude Oil	10^4t						**0**	20	100	71,100	41,816	0
Gasoline	10^4t	0.05				0.01	**0.06**	18.9	100	67,500	43,070	1,744
Diesel Oil	10^4t	1.03	0.44	0.26	0.05	1.64	**3.42**	20.2	100	72,600	42,652	105,902
Fuel Oil	10^4t		0.86	0.04		0.02	**0.92**	21.1	100	75,500	41,816	29,045
LPG	10^4t						**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^8m^3					7.25	**7.25**	15.7	100	48,200	46,055	160,939
Natural Gas	10^4t	0.94	0.24	2.99		7.2	**11.37**	15.3	100	54,300	38,931	2,403,565
Other Petroleum Products	10^4t					0.01	**0.01**	20	100	72,200	41,816	302
Other Coking Products	10^4t						**0**	25.8	100	95,700	28,435	0
Other Energy	10^4tce	93.67	10.58		21.24		**125.49**	0	0	0	0	0
Total												**197,137,915**

Sources: China Energy Statistical Yearbook 2009

Table 6 Calculating CO_2 Emission of NWCPG in 2009

Fuel	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total	Emission factor (tC/TJ)	OXID (%)	Fuel emission factor ($kgCO_2/TJ$)	NCV ($MJ/t,m^3$)	CO_2 Emission（tCO_2e）
		A	**B**	**C**	**D**	**E**	**F=A+B+…+E**	**G**	**H**	**I**	**J**	**K=F×I×J/100000 (quality unit); K=F×I×J/10000 (volume unit)**
Raw Coal	10^4t	3949.22	2060	467.05	2350.13	2380	**11206.4**	25.8	100	87,300	20,908	204,546,878
Cleaned coal	10^4t						**0**	25.8	100	87,300	26,344	0
Other Washed Coal	10^4t	8.34			56.01	6.66	**71.01**	25.8	100	87,300	8,363	518,437
Briquettes	10^4t						**0**	26.6	100	87,300	20,908	0
Coke	10^4t						**0**	29.2	100	95,700	28,435	0
Coke Oven Gas	10^8m^3	0.49	0.8			0.12	**1.41**	12.1	100	37,300	16,726	87,967
Other Gas	10^8m^3	18.37	0.44				**18.81**	12.1	100	37,300	5,227	366,733
Crude Oil	10^4t						**0**	20	100	71,100	41,816	0
Gasoline	10^4t	0.02					**0.02**	18.9	100	67,500	43,070	581
Diesel Oil	10^4t	0.6	0.52	0.2	0.07	0.7	**2.09**	20.2	100	72,600	42,652	64,718
Fuel Oil	10^4t		0.25	0.08		0.06	**0.39**	21.1	100	75,500	41,816	12,313
LPG	10^4t	0.02					**0.02**	17.2	100	61,600	50,179	618
Refinery Gas	10^4t					8.56	**8.56**	15.7	100	48,200	46,055	190,019
Natural Gas	10^8m^3	0.91	0.07	3.93		7.83	**12.74**	15.3	100	54,300	38,931	2,693,177
Other Petroleum Products	10^4t						**0**	20	100	72,200	41,816	0
Other Coking Products	10^4t						**0**	25.8	100	95,700	28,435	0
Other Energy	10^4tce	73.76	18.52		18.08		**110.36**	0	0	0	0	0
Total												**208,481,441**

Sources: China Energy Statistical Yearbook 2010

Table7 The three years weighted average emission factor of NWCPG

Years	**2009**	**2008**	**2007**	Three years average emission factor (tCO_2e/MWh)
Total CO_2 emission(tCO_2e)	208,481,441	197,137,915	180,940,805	**1.0001**
The total fuel fired electricity connected to the grid(MWh)	206,911,050	200,640,770	178,920,940	
$\boldsymbol{EF_{OM,y}}$	**1.00759**	**0.98254**	**1.01129**	

Step 5. Calculate the build margin emission factor

The Emission Factor, Oxidation, Average Low Caloric Value applied in the calculation of the Operating Margin and Build Margin emission factor are listed in table 8.

Table 8 Related Parameters

Fuel	Oxidation	Average Low Caloric Value	Emission Factor($kgCO_2/TJ$)
Raw Coal	100	20,908 KJ/kg	87,300
Cleaned Coal	100	26,344 KJ/kg	87,300
Briquettes	100	20,908 KJ/kg	87,300
Other Washed Coal	100	8,363 KJ/kg	87,300
Coke	100	28,435 KJ/kg	95,700
Crude Oil	100	41,816 KJ/kg	71,100
Gasoline	100	43,070 KJ/kg	67,500
Diesel Oil	100	42,652 KJ/kg	72,600
Fuel Oil	100	41,816 KJ/kg	75,500
Other Petroleum	100	41,816 KJ/kg	75,500
LPG	100	50,179 KJ/kg	61,600
Refinery Gas	100	46,055 KJ/kg	48,200
Natural Gas	100	38,931 MJ/km^3	54,300
Other Petroleum Products	100	41,816 KJ/kg	75,500
Other Coking Products	100	28,435 KJ/kg	95,700

Sub-step 1. Calculating the percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions

Table 9 The percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions

Fuel	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Subtotal	NCV ($MJ/t,m^3$)	Emission factor (tCO_2e/TJ)	Oxid (%)	CO_2 Emission (tCO_2e)
		A	**B**	**C**	**D**	**E**	**F=A+…+E**	G	H	I	**J=F×G×H×I/100,000**
Raw Coal	10^4 t	3,949.22	2,060	467.05	2,350.13	2,380	11,206.4	20,908	87,300	100	204,546,878
Washed coal	10^4 t	0	0	0	0	0	0	26,344	87,300	100	0
Other Washed Coal	10^4 t	8.34	0	0	56.01	6.66	71.01	8,363	87,300	100	518,437
Mould coal	10^4 t	0	0	0	0	0	0	20,908	87,300	100	0
Coke	10^4 t	0	0	0	0	0	0	28,435	95,700	100	0
Other Coking Products	10^4 t	0	0	0	0	0	0	28,435	95,700	100	0
Subtotal											**205,065,315**
Crude Oil	10^4 t	0	0	0	0	0	0	41,816	71,100	100	0
Gasoline	10^4 t	0.02	0	0	0	0	0.02	43,070	67,500	100	581
Diesel Oil	10^4 t	0.6	0.52	0.2	0.07	0.7	2.09	42,652	72,600	100	64,718
Fuel Oil	10^4 t	0	0.25	0.08	0	0.06	0.39	41,816	75,500	100	12,313
Other Petroleum Products	10^4 t	0	0	0	0	0	0	41,816	72,200	100	0
Subtotal											**77,612**
Natural Gas	10^7m^3	9.1	0.7	39.3	0	78.3	127.4	38,931	54,300	100	2,693,177
Coke Oven Gas	10^7m^3	4.9	8	0	0	1.2	14.1	16,726	37,300	100	87,967
Other Gas	10^7m^3	183.7	4.4	0	0	0	188.1	5,227	37,300	100	366,733
LPG	10^4 t	0.02	0	0	0	0	0.02	50,179	61,600	100	618
Refinery Gas	10^4 t	0	0	0	0	8.56	8.56	46,055	48,200	100	190,019
Subtotal											**3,338,514**
Total											**208,481441**

Sources: China Energy Statistical Yearbook 2010

The result from the above table: $\lambda_{Coal,y}$ = **98.36%,** $\lambda_{Oil,y}$ = **0.04%,** $\lambda_{Gas,y}$ = **1.60%**

Sub-step 2. Calculating the fuel-fired emission factor

$$EF_{Thermaly} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y}$$

Where:
$EF_{Thermal}$ is the fuel-fired emission factor;
$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are corresponding to the emission factors of coal, oil and gas fired power plants which are applied by the most advanced commercialized technologies.

According to the announcement "China's Regional Grid Baseline Emission Factors Renewed", the weighted average of coal consumption per kWh supplied of 30 new built 600 MW sub critical units in 2007 is adopted to determine the emission factor of the best advanced coal fired generation technology, which is 311.5 gce/kWh. In other word, the efficiency of best advanced coal fired generation technology is 39.45%.

The maximum electricity supplied efficiency of oil and gas fired generation plants are regarded as approximate estimation of commercially optimal efficiency technology. Similarly, the fuel consumption per kWh supplied of best advanced oil and gas fired generation technology is determined to be 237.4 gce/kWh, which means a generation efficiency of 51.77% .these data were show as below:

Table 10 Emission factors of Coal, Oil and Gas with the most advanced commercialized technologies applied by the fuel-fired power plants

	Parameters	Fuel consumption rate(%)	Fuel Emission Factor($kgCO_2/TJ$)	Oxidation	Emission Factor（tCO_2/MWh）
		A	B	C	D=3.6/A/1000000*B*C
Coal-fired plant	$EF_{Coal,Adv}$	39.45	87,300	1	0.7967
Oil-fired plant	$EF_{Oil,Adv}$	51.77	75,500	1	0.5251
Gas-fired plant	$EF_{Gas,Adv}$	51.77	54,300	1	0.3776

Sources: The Baseline Emission Factors of Chinese Power Grids, NDRC.

Then, calculating

$$EF_{Thermaly} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} = 0.\ 7899\ tCO_2/MWh$$

Sub-step 3. Calculating the Build Margin Emission Factor.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal}$$

Where:

$EF_{BM,y}$ = the Build Margin emission factor with advanced commercialized technologies for year *y*;

CAP_{Total} = the new capacity additions;

$CAP_{Thermal}$ = the new fuel-fired capacity additions.

Table 11 Installed Capacities of the NWCPG 2009

Installed Capacity	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Fuel-fired	MW	19,900	10,990	1,930	8,820	9,520	51,160
Hydro	MW	1,920	5,940	8,740	430	2,430	19,460
Nuclear	MW	0	0	0	0	0	0
Wind&Others	MW	0	750	0	270.3	860	1,880
Total	MW	21,820	17,680	10,670	9,520	12,810	72,500

Sources：China Electric Power Yearbook 2010

Table 12 Installed Capacities of the NWCPG 2008

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

Sources：China Electric Power Yearbook 2009

Table 13 Installed Capacities of the NWCPG 2007

Installed Capacity	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Fuel-fired	MW	12,290	7,840	1,900	7,030	6,560	35,620
Hydro	MW	1,790	4,400	5,830	430	2,140	14,590
Nuclear	MW	0	0	0	0	0	0
Wind & Others	MW	72.5	346	0	50	330	798.5
Total	MW	14,152.5	12,586	7,730	7,510	9,030	51,008.5

Sources：China Electric Power Yearbook 2008

Table 14 Change Installed Capacity from 2007-2009

	Year 2007	Year 2008	Year 2009	2007-2009 New Capacity	Percentage of New Capacity Additions
	A	B	C	D=C-A	
Fuel-fired (MW)	35,620	44,570	51,160	16,998	74.07%
Hydro (MW)	14,590	15,780	19,460	4,870	21.22%
Nuclear (MW)	0	0		0	0.00%
Wind(MW)	798.5	1,280	1,880.3	1,081.8	4.71%
Total	**51,008.5**	**61,630**	**72,500.3**	**22,949.8**	**100.00%**
Percentage of Year 2009				31.65%	

Then, the result is $EF_{BM,y} = EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal}$

= 0.7899×74.07%=**0.5851** tCO_2/MWh

Step 6. calculate the combined margin Emission Factor (EF_y)

$EF_{grid,CM,y}$= 0.75×$EF_{grid,OM,y}$+ 0.25×$EF_{grid,BM,y}$

= 0.75 × 1.00015 tCO_2/MW + 0.25 × 0.5851 tCO_2/MW = **0.89635** tCO_2/MW

Appendix 5: Further background information on monitoring plan

No further background information used in the development of the monitoring plan.

Appendix 6: Summary of post registration changes

No further information.