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

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Qinghai Delingha Xiehe Solar PV Power Generation Project
Version number of the PDD	1.1
Completion date of the PDD	15/09/2012
Project participant(s)	Delingha Xiehe Solar PV Power Generation Co., Ltd; Carbon Resource Management S.A.
Host Party(ies)	People's Republic of China
Sectoral scope and selected methodology(ies)	01 Energy industries ACM0002 Version 12.3.0
Estimated amount of annual average GHG emission reductions	46,530 tCO2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The purpose of the proposed Qinghai Delingha Xiehe Solar PV Power Generation Project (the Proposed Project Activity) is the generation of electricity from solar and the supply of this electricity to the Northwest China Power Grid (NWPG, the Grid). The Proposed Project Activity will install and operate 128,400 solar cell modules with a capacity of 235 Wp each. Therefore, the project scenario is the installation of 30.174 MWp of renewable energy power generation capacity, and the supply to the Grid of 48,084.39 MWh (average value for the 25 operational years) of electricity generated from renewable energy. In accordance with the methodology there are no project emissions.

The baseline scenario, which is the same as the scenario existing prior to the implementation of the Proposed Project Activity, is, according to the methodology:

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".

As the Grid is dominated by fossil fuel-fired power generation, the establishment of the Proposed Project Activity will lead to greenhouse gas (GHG) emission reductions. Following the methodology, the emission reductions are estimated to be on average 46,530 tonnes of CO2 equivalent (tCO2e) per year, and 325,711 tCO2e over the first 7-years crediting period.

The Proposed Project Activity will contribute to sustainable development in the following ways:

- It will promote local economic development by creating local employment opportunities during both the construction and operational phase of the proposed project activity.
- It will generate electricity from renewable sources.
- It will promote technology development, through the use of advanced technology.
- It will reduce GHG emissions in China compared to the baseline/business-as-usual scenario.
- It will reduce the emissions of other pollutants associated with the operation of fossil fuel-fired thermal power plant, including SO2 and soot, as well as reducing thermal pollution from cooling water in the baseline/business-as-usual scenario.

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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Qinghai Province

A.2.3. City/Town/Community etc.

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Delingha City

A.2.4. Physical/Geographical location

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Table 1 Geographical co-ordinates of the project area

	Longitude (East)	Latitude (North)
Central point	97°10′23.7″ (97.17325°)	37°21′10.29″ (37.35286°)

Source: Feasibility Study Report.

Figure 1 Location of the Proposed Project Activity

A.3. Technologies and/or measures

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The solar PV electricity generation system consists of Solar cell modules, Header box, Inverter and Transformer. The polycrystalline silicon solar module is the key component of the Proposed Project Activity, which converts the solar optical energy into direct current electricity via the photovoltaic effect taking place at the interface of the specific semiconductor materials. As the main equipments will be manufactured in China, there is no overseas technology introduced for the project.

Table 2 Technology Parameters

Parameter	Value
Solar cell modules	
Manufacturer	Jiangxi Saiwei LDK Solar High-technology Co., Ltd
Model	LDK-235P-20
Maximum Power	235Wp
Life time	25 years
Inverters	
Manufacturer	Guodian Nanrui Jidian New Energy (Nanjing) Co., Ltd
Model	EHE-N500KTL
Rated Power	500kW

The total installed capacity will be 30.174 MWp. The expected plant load factor of 18.2% (average value for the 25 operational years) is determined by a third party contracted by the project participants in the FSR using detailed onsite information and long-term local solar energy data, in accordance with EB guidance on plant load factors (EB48 Annex 11).

The generation and consumption of the Proposed Project Activity is monitored continuously through two meters (main and back-up) installed in the onsite substation. The data is used for the calculation of exports to the grid and imports from the grid.

In the baseline scenario, which is the same as the scenario existing prior to the implementation of the Proposed Project Activity, the facilities, systems and equipment in operation are all power plants connected physically to the electricity system that the CDM project power plant is connected to.[1]

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)	Delingha Xiehe Solar PV Power Generation Co., Ltd	No
United Kingdom of Great Britain and Northern Ireland	Carbon Resource Management S.A.	No

A.5. Public funding of project activity

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The Proposed Project Activity does not receive public funding from Parties included in Annex I.

SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

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(a) The selected methodology(ies):

- ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.3.0).

(b) Any tools and other methodologies to which the selected methodology(ies) refer:

- AM Tool 01 "Tool for the demonstration and assessment of additionality" (Version 6.0.0);
- AM Tool 07 "Tool to calculate the emission factor for an electricity system" (Version 02.2.1);
- AM Tool 02 "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 4.0.0) (this tool is not applicable to the Proposed Project Activity);
- AM Tool 03 "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 2) (this tool is not applicable to the Proposed Project Activity).

B.2. Applicability of methodology

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This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the

[1] The project electricity system is determined in B.6.

implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).

The methodology is applicable as the Proposed Project Activity is the installation of a Greenfield, grid-connected solar PV power plant (a).

The methodology is applicable under the following conditions:

Criteria	Applicability	Conclusion
The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit	The Proposed Project Activity is the installation of a solar PV power plant.	OK
In the case of capacity additions, retrofits or replacements (except for capacity addition projects for which the electricity generation of the existing power plant(s) or unit(s) is not affected): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity addition or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity	Not applicable. The Proposed Project Activity is a Greenfield plant and does not represent a capacity addition, retrofit or replacement.	OK
In case of hydro power plants: • At least one of the following conditions must apply: o The project activity is implemented in an existing single or multiple reservoirs, with no change in any of the reservoirs; or o The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of the	Not applicable. The Proposed Project Activity is a solar PV power plant.	OK

reservoirs is increased and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m2 after the implementation of the project activity; or o The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m2 after the implementation of the project activity.		
In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m2 after the implementation of the project activity all of the following conditions must apply: • The power density calculated for the entire project activity using equation 5 is greater than 4 W/m2; • All reservoirs and hydro power plants are located at the same river and where are designed together to function as an integrated project that collectively constitutes the generation capacity of the combined power plant; • The water flow between the multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; • The total installed capacity of the power units, which are driven using water from the reservoirs with a power density lower than 4 W/m2, is lower than 15 MW; • The total installed capacity	Not applicable. The Proposed Project Activity is a solar PV power plant.	OK

of the power units, which are driven using water from reservoirs with a power density lower than 4 W/m2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.		

The methodology is not applicable to the following:

Criteria	Applicability	Conclusion
Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;	Not applicable. The Proposed Project Activity does not involve switching from fossil fuels to renewable energy at the site of the project activity.	OK
Biomass fired power plants	Not applicable. The Proposed Project Activity is a solar PV power plant.	OK
Hydro power plant[2] that result in the creation of a new single reservoir or in the increase in an existing single reservoir where the power density of the reservoir is less than 4 W/m^2.	Not applicable. The Proposed Project Activity is a solar PV power plant.	OK

In addition, the applicability conditions included in the tools applied and referred to above apply as follows:

Tool / Criteria	Applicability	Conclusion
AM Tool 01 / Once the additionally tool is included in an approved methodology, its application by project participants using this methodology is mandatory.	The chosen methodology prescribes the use of this tool. There are no further applicability criteria for using the tool.	OK
AM Tool 07 / This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity, i.e. where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided	The Proposed Project Activity is the installation of a solar PV power plant supplying electricity to the Grid.	OK

[2] Project participants wishing to undertake a hydroelectric project activity that result in a new reservoir or an increase in the existing reservoir, in particular where reservoirs have no significant vegetative biomass in the catchments area, may request a revision to the approved consolidated methodology.

by the grid (e.g. demand-side energy efficiency projects).		
AM Tool 07 / In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex-I country.	The project electricity system is located in a non-Annex I country.	OK

Any conditions for the application of the tools are addressed in the sections below where the tools are used, sections B.5 and B.6, showing that the tools are applicable to the Proposed Project Activity. In addition, it is noted that:

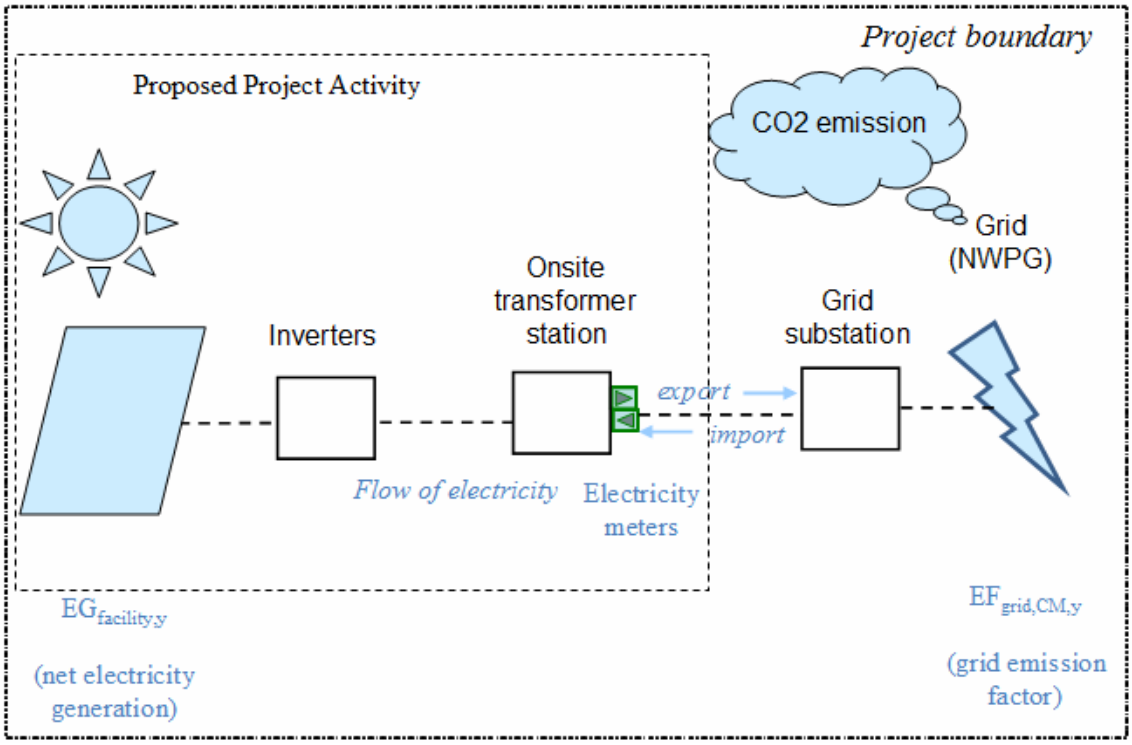
- the Proposed Project Activity is a Greenfield project, therefore the "Combined tool to identify the baseline scenario and demonstrate additionality" is not required to identify the baseline scenario of the Proposed Project Activity; and
- the Proposed Project Activity is a solar PV power project, therefore there are no fossil fuels used for electricity generation, so there are no CO2 emissions and leakage from combustion of fossil fuels, and thus the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" is not applicable to the Proposed Project Activity.

B.3. Project boundary

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO_2	Yes	Main emissions source.
		CH_4	No	Minor emissions source.
		N_2O	No	Minor emissions source.
		Other	No	Not included in the methodology.
Project scenario	For geothermal power plants, fugitive emissions of CH4 and CO2 from non-condensable gases contained in geothermal steam.	CO_2	No	Not applicable since the project is a newly installed solar PV power plant.
		CH_4	No	
		N_2O	No	
		Other	No	
	CO2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants.	CO_2	No	Not applicable since the project is a newly installed solar PV power plant.
		CH_4	No	
		N_2O	No	
		Other	No	
	For hydro power plants, emissions of CH4 from the reservoir	CO_2	No	Not applicable since the project is a newly installed solar PV power plant.
		CH_4	No	
		N_2O	No	
		Other	No	

In addition to the table, a flow diagram of the project boundary is presented below, physically delineating the Proposed Project Activity, based on the description provided in section A.3 above. The flow diagram physically delineates the project boundary, includes the flow of electricity and represents the emissions included (EF: emission factor) and the monitoring variable (EG: net electricity generation).

Figure 2 Flow diagram and the project boundary



B.4. Establishment and description of baseline scenario

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

Electricity delivered to the grid by the project 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".

The selected methodology prescribes the baseline scenario, thus no further analysis is required.[3] The combined margin calculated in Section B.6 below.

B.5. Demonstration of additionality

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CDM consideration

The start date of the project activity is prior to the date of publication of the PDD for the global stakeholder consultation, but after 02 Aug 2008. Therefore, the project participant informed the Host Party DNA and the UNFCCC secretariat in writing of the commencement of the project activity and of

[3] Validation and Verification Standard (EB65 Annex 4), para 113.

the intention to seek CDM status. These notifications were made within 180 days of the Proposed Project Activity start date in accordance with the Project Standard[4] and Project Cycle Procedure[5].

Table 3 Timeline of the implementation of the project

Time	Milestone
05/2011	FSR was completed.
26/05/2011	Board meeting decided to apply for CDM on the basis of the FSR conclusions
01/07/2011	ERPA was signed
05/07/2011	Inverter contract was signed (Project starting date)[6]
05/07/2011	Solar cell module purchase contract was signed
17/07/2011	Mounting brackets contract was signed
21/07/2011	Construction contract was signed
22/07/2011	Start of construction
23/11/2011	Notification to EB of the CDM intention
27/12/2011	Notification to DNA of the CDM intention
19/04/2012	Start of GSP

Additionality

According to the selected methodology the additionality of the Proposed Project Activity shall be demonstrated and assessed using the "Tool for the demonstration and assessment of additionality"[7]. The Tool consists of the steps below.

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

Sub-step 1a. Define alternatives to the project activity:

The PDD shall identify credible alternatives to the project activity in order to determine the most realistic baseline scenario, unless the approved methodology that is selected by the proposed CDM project activity prescribes the baseline scenario and no further analysis is required.[8]

As per the methodology and tools, two possible alternatives to the proposed project activity are presented as follows:

Alternative 1: The proposed project activity not implemented as a CDM project activity;
Alternative 2: Continuation of the current situation, i.e. electricity delivered to the grid will continue to be generated by operation of grid-connected power plants and by the addition of new generation sources.

The Proposed Project Activity is the installation of a new grid-connected renewable power plant, and is not a capacity addition, retrofit or replacement of existing grid-connected renewable power plant/unit. Therefore, the baseline scenario according to the methodology is the following (i.e. the alternative 2):

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".

[4] EB65 Annex 5, para 27.
[5] EB66 Annex 64, para 7.
[6] This is the first contract signed. Other contracts are signed (shortly) after.
[7] Version of the tool given in B.1.
[8] Validation and Verification Standard (EB 65 Annex 4), para 115.

Sub-step 1b. Consistency with mandatory laws and regulations:

The alternatives above are realistic and feasible and comply with applicable laws and regulations.

Step 2. Investment analysis

The purpose of this step is to 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, the following sub-steps are used and the guidelines provided by the Board on investment analysis[9] are taken into account:

Sub-step 2a. Determine appropriate analysis method

The purpose of this sub-step is to determine whether to apply the simple cost analysis, investment comparison analysis or benchmark analysis (sub-step 2b):

The Proposed Project Activity generates financial benefits by the sales of electricity, so the simple cost analysis (Option I) can not be applied. According to EB guidelines[10], if the alternative to the Proposed Project Activity is the supply of electricity from the grid, this is not considered an investment and a benchmark approach is considered appropriate. As the baseline alternative involves the continuation of current practices, supply of electricity from the grid, a benchmark analysis is used to identify whether the project is economically attractive (Option III). The use of a benchmark analysis is also in line with Chinese practice and is followed in the FSR.

Therefore, the benchmark analysis (Option III) is adopted.

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

According to the "Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects" issued by former State Power Corporation of China in 2002, the benchmark of total investment financial internal rate of return (project IRR) of electric power industry is 8% (after tax), and only if the project IRR of the Proposed Project Activity is higher than or equivalent to this benchmark, the Proposed Project Activity is financially feasible. This benchmark is commonly used in the electricity sector, and therefore appropriate in accordance with the EB guidelines[11].

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

The financial analysis in the PDD of this Proposed Project Activity is derived from the Feasibility Study Report (FSR) which is approved by the national authorities.

(a) The FSR is the basis for the decision to proceed with the investment in the project, i.e. that the period of time between the finalization of the FSR and the investment decision is sufficiently short that it is unlikely in the context of the underlying project activity that the input values would have materially changed. The period of time between the finalisation of the FSR (05/2011), and the board decision date

[9] 'Guidelines on the Assessment of Investment Analysis' (version 05), EB 62 Annex 5.
[10] 'Guidelines on the Assessment of Investment Analysis' (version 05), EB 62 Annex 5, para 19.
[11] 'Guidelines on the Assessment of Investment Analysis' (version 05), EB 62 Annex 5, para 12 and 13.

(26/05/2011) is sufficiently short, and therefore it is not likely that the input values would have materially changed.
(b) The values used in the PDD and associated annexes are fully consistent with the FSR.
(c) The investment estimation in the FSR was carried out by an independent design institute[12], and is based on the national regulation and the material and equipment price level. A detailed assessment of the accuracy and suitability of the most important parameters is given below. This assessment shows that each of the input parameters is valid and applicable.

As indicated as a preference in the EB guidelines[13], the period of assessment reflects the full period of expected operation of the Proposed Project Activity.

The cost of financing expenditures is not included in the calculation of project IRR; however such costs are calculated to help estimate the level of taxes due.

Input values[14]

In accordance with the additionality tool[15] the investment analysis is presented in a transparent manner and with all the relevant assumptions provided in the IRR calculation spreadsheet. The main parameters for the investment analysis of the Proposed Project Activity are listed below, with a detailed assessment of the accuracy and suitability of these parameters in sub-step 2d. All detailed input parameters, derived from the FSR which was completed by an independent third party, are given in the IRR calculation spreadsheet.

Table 4 Key data for the financial indicator calculation

Item	Value
Average annual net electricity generation	48,084.39 MWh
Static investment	549.8525 mRMB
Average annual O&M cost	7.56 mRMB/y
Tariff (incl. VAT)	1.15 RMB/kWh
Operating life	25 years
Depreciation Period	19 years
Residual value	5%
Value Added Tax	17%
Income tax	25%
City Build tax	5%
Education tax	4%

Source: Feasibility Study Report, 05/2011.
Note: FSR approved by the Qinghai Provincial DRC in 06/2011.

Comparison of the financial indicators

A comparison of the financial indicator for the Proposed Project Activity and the financial benchmark is presented in Table 4 below. It shows that the Proposed Project Activity has a less favourable indicator (i.e. lower IRR) than the benchmark identified in sub-step 2b, and therefore the Proposed Project Activity cannot be considered as financially attractive.

[12] An experience design institute with the highest certificate (grade A).
[13] 'Guidelines on the Assessment of Investment Analysis' (version 05), EB 62 Annex 5, para 3.
[14] Parameter values may be rounded in the text, but calculations are based on all non-rounded values.
[15] Para 32.

Table 5 Comparison of indicators

	Project IRR
Proposed Project Activity	6.05%
Benchmark	8%

Note: See calculation spreadsheet.

Sub-step 2d. Sensitivity analysis

A sensitivity analysis is used to show whether the conclusion regarding the economic or financial attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis above provides a valid argument in favour of additionality as the sensitivity analysis consistently supports the conclusion that the Proposed Project Activity is unlikely to be economically or financially attractive for a realistic range of assumptions.

According to EB guidelines[16], only variables that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variations. For the Proposed Project Activity, the key variables analysed, which constitute more than 20% of costs or revenues, are:

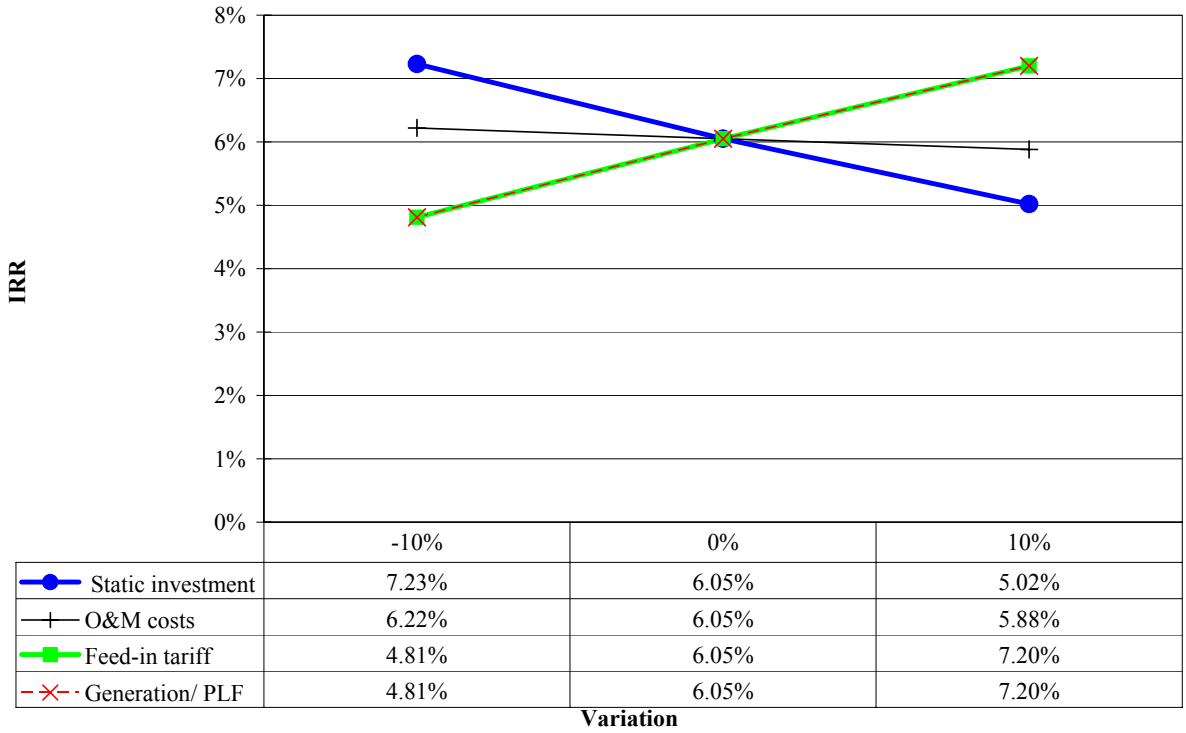
1) Investment costs;
2) Tariff (incl VAT);
3) Generation / plant load factor;
4) O&M costs;

In line with EB guidelines[17], the range of variations in the sensitivity analysis covers a range of +10% and –10%, which is also in line with the regulations in China. Greater variations are unlikely, as discussed below, and in line with the regulations are not considered. The result of the sensitivity analysis is presented below, showing that the benchmark is not reached.

In line with normal practice, the key parameters above are subjected to the range of variations in the sensitivity analysis independently of each other, i.e. the other main parameters remaining the same. Therefore, for example, when the investment costs are varied, the estimated O&M costs remains as per the FSR values.

[16] 'Guidelines on the Assessment of Investment Analysis' (version 05), EB 62 Annex 5, para 20.
[17] 'Guidelines on the Assessment of Investment Analysis' (version 05), EB 62 Annex 5, para 21.

Figure 3 Sensitivity analysis



	-10%	0%	10%
Static investment	7.23%	6.05%	5.02%
O&M costs	6.22%	6.05%	5.88%
Feed-in tariff	4.81%	6.05%	7.20%
Generation/ PLF	4.81%	6.05%	7.20%

The financial analysis shows that the project is not the most financially attractive alternative, and the sensitivity analysis shows that without CER revenue IRR of the project will not reach the benchmark 8% for any reasonable variation in the main parameters.

Investment costs

For solar PV power projects, the costs of solar cell modules, engineering construction and related accessories comprise the main budget of static investment. As the prices of the raw material and man power have been increasing[18], a significant decrease of the static investment costs is unlikely. Therefore, it was not realistic for the Developer to assume that the investment costs of the Proposed Project Activity could be 15.9% lower than estimated in the FSR in order to reach the benchmark, which is outside the realistic range used in the sensitivity analysis.

The main contracts already signed (including solar cell module purchase contract, Inverter contract, Box transformer purchase contract, Stent purchase contract and the construction contract, etc) equal to 478.612 million RMB, representing 87.04% of the estimated static investment from the FSR. Therefore, it is not possible for the investment costs to be reduced by the 15.9% required to reach the benchmark.

Tariff

The expected on-grid tariff used for the financial analysis in the FSR refers to the most recent tariff for solar PV power projects, as available at the time of writing the FSR[19]. On 24/07/2011, the tariff of the PV solar projects in China was unified and officially determined by NDRC throughout document Fa Gai Jia Ge [2011] No. 1594. As per document the tariff of 1.15 RMB/kWh (incl. VAT) will be assigned to projects approved before 01/07/2011 and which have started commissioning before 31/12/2011. All other solar projects, excluding those in Tibet, will receive a feed-in tariff of 1.00 RMB/kWh (incl. VAT). In accordance with the NDRC tariff notification (Fa Gai Jia Ge [2011] No. 1594), the tariff for solar power

[18] http://epaper.shaoxing.com.cn/ttsb/html/2011-08/23/content_565972.htm;
http://www.solar001.com/Infomation/showinfo.aspx?ID=11932
[19] http://www.sdpc.gov.cn/zcfb/zcfbtz/2010tz/t20100409_339707.htm

projects will be fixed, and not exceed 1.15 RMB/kWh. Therefore, it was not realistic to assume that the tariff could be 17.6% higher than estimated in the FSR in order to reach the benchmark.

Generation / plant load factor
The expected power generation of the Proposed Project Activity is calculated by an independent qualified design institute with the highest grade (Grade A) in the FSR. Therefore, the generation and plant load factor determination are in line with both options of the EB Guidelines for the reporting and validation of plant load factors (EB 48 Annex 11): (a) provided to the government while applying the project activity for implementation approval, and (b) determined by a third party contracted by the Developer.

The electricity report in the FSR is based on onsite solar radiation measurements, the solar radiation assessment records for 1978 to 2008 and the output characteristics of the solar cell modules, using a scientific approach applied internationally, so there is an annual decrease in electricity generation which equals to circa 20% degeneration during the 25years of operations. This is compliance with what reported in the 'Solar Energy Technology Multi Year Program Plan' 2007-2011 issued by the U.S. Department of Energy, "most crystalline-silicon manufacturers offer warranties of 25 years, typically guaranteeing that the power output of the module will not decrease by more than 20% over this period"[20].

Therefore, it is not credible to assume that generation from the proposed project would increase by more than 17.6% each year on average over the lifetime of the project in order the reach the benchmark 8%.

O&M costs
The operation and maintenance costs in the approved feasibility study were derived from the experience of the Developer and the design institute. Even if O&M costs would decrease to zero, the IRR of the Proposed Project would still not reach the benchmark rate of 8%.

Conclusion

The financial analysis shows that the Proposed Project Activity is not financially attractive, and the sensitivity analysis shows that it is unlikely to be financially attractive compared to the benchmark under any reasonable variations in the assumptions. However, the revenue from the CERs will greatly improve the financial feasibility of the Proposed Project Activity, and it will also improve the ability to hedge risks.

In conclusion, the Proposed Project Activity is not financially feasible without the revenue of CERs. Therefore, the analysis proceeds to step 4.

Step 3. Barrier analysis

Not applied.

Step 4. Common practice analysis

The proposed project activity is not a first-of-its kind project, therefore the above test is complemented with an analysis of the extent to which the proposed project type has already diffused in the relevant sector and region, acting as a credibility check to the analysis above.

In line with the tool, if the Proposed Project Activity is one of four types of measures listed in paragraph 6, the common practice analysis is carried out in four steps identified in paragraph 47 of the tool:

(a) Fuel and feedstock switch;
(b) Switch of technology with or without change of energy source (including energy efficiency

[20] 'Solar Energy Technology Multi Year Program Plan' 2007-2011 p.37, issued by the U.S. Department of Energy

improvement as well as use of renewable energies);
(c) Methane destruction;
(d) Methane formation avoidance.

As a newly-constructed solar PV power project, the proposed project is a type (b) measure.

Therefore, the existing common practice is identified and analysed though the steps below:

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

The total installed capacity of the Proposed Project is 30.174 MWp, therefore the applicable output range is 15.087MWp to 45.261 MWp.

Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM project activities and projects activities undergoing validation shall not be included in this step;

The applicable geographical area covers the entire host country as a default; if the technology applied in the project is not country specific, then the applicable geographical area should be extended to other countries. Project participants may provide justification that the applicable geographical area is smaller than the host country for technologies that vary considerably from location to location depending on local conditions.

Grid connected power generation from solar PV varies considerably from location to location. In China, the regulatory framework and investment climate for grid-connected projects in the applicable output range are only similar and comparable for projects connected to the same grid and located in the same Province/Autonomous Region. Projects are approved by the provincial DRC, and the projects' EIAs by the provincial Environmental Protection Bureau. Therefore, any project connected to a different grid or located in a different Province/Autonomous Region would always be a different technology under step 3. Thus it is appropriate to limit the analysis to projects connected to the same grid and located in the same Province/Autonomous Region. Therefore, the applicable geographical area is defined by projects connected to NWPG and located in Qinghai province.

The proposed project activity start date is 5 July 2011, therefore only projects which started commercial operation prior to 5 July 2011 are considered.

Other CDM projects activities (registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) are not to be included in this analysis, according to the EB guidance on the additionality tool.

The number of all plants within the applicable output range and applicable geographical area, which started the commercial operation before the starting date of the Proposed Project Activity, can be found as follows:

$N_{all} = N_{all\ PV} + N_{all\ other}$

Where
N_{all} is all plants within the applicable output range and applicable geographical area, which started the commercial operation before the starting date of the Proposed Project Activity;
$N_{all\ PV}$ is the number of all solar PV projects within the applicable output range and applicable geographical area, which started the commercial operation before the starting date of the Proposed Project

Activity;
$N_{all\ other}$ is the number of all non-PV plants within the applicable output range and applicable geographical area, which started the commercial operation before the starting date of the Proposed Project Activity.

Based on the public available information[21], no solar projects can be identified within the applicable output range and applicable geographical area by the end of May 2012, which started the commercial operation before the starting date of the Proposed Project Activity, which have not published a PDD on the UNFCCC website for global stakeholder consultation. Thus $N_{all\ PV}$ is 0.

Therefore, since $N_{all\ PV}$ is 0:

$N_{all} = N_{all\ PV} + N_{all\ other} = 0 + N_{all\ other} = N_{all\ other}$

Step 3: Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}.

Different technologies in the context of common practice are technologies that deliver the same output and differ by at least one of the following (as appropriate in the context of the measure applied in the proposed CDM project and applicable geographical area):

(a) Energy source/fuel;
(b) Feed stock;
(c) Size of installation (power capacity):
    (i) Micro (as defined in paragraph 24 of Decision 2/CMP.5 and paragraph 39 of Decision 3/CMP.6);
    (ii) Small (as defined in paragraph 28 of Decision 1/CMP.2);
    (iii) Large;
(d) Investment climate in the date of the investment decision, inter alia:
    (i) Access to technology;
    (ii) Subsidies or other financial flows;
    (iii) Promotional policies;
    (iv) Legal regulations;
(e) Other features, inter alia:
    (i) Unit cost of output (unit costs are considered different if they differ by at least 20 %);

The number of plants within the applicable output range and applicable geographical area, which started the commercial operation before the starting date of the Proposed Project Activity, that apply technologies different with the technology applied in the proposed project activity can be found as follows:

$N_{diff} = N_{diff\ PV} + N_{diff,other}$

Where
N_{diff} is all plants within the applicable output range and applicable geographical area, which started the commercial operation before the starting date of the Proposed Project Activity, that apply technologies different with the technology applied in the proposed project activity;
$N_{diff\ PV}$ is the number of solar PV projects within the applicable output range and applicable geographical area, which started the commercial operation before the starting date of the Proposed Project Activity, that apply technologies different with the technology applied in the proposed project activity;
$N_{diff,other}$ is the number of all projects that are included in N_{diff} but not included in $N_{diff,PV}$

[21] http://www.qhfgw.gov.cn/; http://cdm.ccchina.gov.cn/web/index.asp; http://cdm.unfccc.int/Projects/Validation/index.html

In accordance with the conclusion of ***Step 2***, no solar PV projects in Qinghai province within the applicable output range and applicable geographical area, which started the commercial operation before the starting date of the Proposed Project Activity can be identified different with the proposed project. Thus, $N_{diff,PV}=0$.

Except for solar PV projects, there are wind plants, hydropower plants, biomass plants, etc. which are apparently different from the proposed project with respect to energy source/fuel and feed stock. So, all the other plants (except solar PV projects) are identified as plants applying different technologies.

Therefore, $N_{diff}= N_{diff,other} =N_{all,other}$

Step 4: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

$F = 1 –N_{diff} / N_{all} = 1 – N_{all,other} / N_{all,other} = 1 – 1 = 0$

Conclusion

In conclusion, the Proposed Project Activity is not considered common practice within the sector in the applicable geographical area, because:

(a) F is not greater than 0.2, and
(b) $N_{all} – N_{diff}$ is not greater than 3.

All the steps above are satisfied, the Proposed Project Activity is not the baseline scenario, and the Proposed Project Activity is additional in accordance with the Additionality Tool.

B.6. Emission reductions
B.6.1. Explanation of methodological choices
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Project emissions

According to the methodology, for most renewable energy project activities, $PE_y = 0$. However, the methodology prescribes project emission calculations for geothermal, solar thermal and hydro power plant. As a solar PV power plant, therefore, there are no project emissions according to the methodology:

$PE_y = 0$ (1)

Baseline emissions

According to the methodology, the baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are calculated as follows:

$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$ (2)

Where:
BE_y is the baseline emissions in year y (tCO2).
$EG_{PJ,y}$ is the quantity of net electricity generation that is produced and fed into the grid as a result of the

implementation of the CDM project activity in year y (MWh).
$EF_{grid,CM,y}$ is the combined margin CO2 emission factor for grid connected power generation in year y calculated using the "Tool to calculate the emission factor for an electricity system"[22] (tCO2/MWh).

Calculation of $EG_{PJ,y}$

(a) Greenfield renewable energy power plants

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

$$EG_{PJ,y} = EG_{facility,y} \quad (3)$$

Where:
$EG_{PJ,y}$ is the quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh).
$EG_{facility,y}$ is the quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh).

Baseline emission factor

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

Details of the calculations and data follow the published data from the Chinese DNA[23] and official national statistics, and are presented in the enclosed EF calculation spreadsheet.

Step 1. Identify the relevant electricity systems

For determining the electricity emission factors, identify the relevant project electricity system. Similarly, identify any connected electricity system. If a connected electricity system is located partially or totally in Annex-I countries, then the emission factor of that connected electricity system should be considered zero. If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used.

The DNA has published a delineation of the project electricity system and connected electricity systems, therefore these delineations are used in accordance with the Tool[24]:

- The project electricity system is the Northwest China Power Grid (NWPG), consisting of five provincial grids: Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang power grids.
- The connected electricity system is the Central China Power Grid (CCPG), consisting of six provincial grids: Henan, Hubei, Hunan, Jiangxi, Sichuan and Chongqing.

For the purpose of this tool, the reference system is the project electricity system. Hence electricity transfers from a connected electricity systems to the project electricity system are defined as electricity

[22] Version of the tool given in B.1.
[23] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf, Department of Climate Change, NDRC, 2011-10-20.
[24] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf, Department of Climate Change, NDRC, 2011-10-20.

imports while electricity transfers from the project electricity system to connected electricity systems are defined as electricity exports.

For the purpose of determining the build margin emission factor, the spatial extent is limited to the project electricity system, except where recent or likely future additions to the transmission capacity enable significant increases in imported electricity. In such cases, the transmission capacity may be considered a build margin source.

- There are no recent or likely future additions to transmission capacity that would enable significant increases in imported electricity; the data in Annex 3 shows that imports are relatively small and have not changed significantly in the period covered. Therefore, the transmission capacity is not considered a build margin source.

For the purpose of determining the operating margin emission factor, use one of the following options to determine the CO2 emission factor(s) for net electricity imports from a connected electricity system:

0 tCO_2/MWh; or

(a) The weighted average operating margin (OM) emission rate of the exporting grid, determined as described in Step 4 (d) below; or
(b) The simple operating margin emission rate of the exporting grid, determined as described in Step 4 (a), 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 Step 4 (b) below.

- Following the calculations of the DNA, the simple operating margin (option (b) is used to calculate the CO2 emission factors for net electricity imports ($EF_{grid,import,y}$).

For imports from connected electricity systems located in Annex-I country(ies), the emission factor is 0 tonnes CO2 per MWh.

- There are no imports from Annex-I country(ies).

Electricity exports should not be subtracted from electricity generation data used for calculating and monitoring the electricity emission factors.

- Electricity exports from the project electricity system to the connected electricity system are not subtracted from electricity generation data used for calculating and monitoring the electricity emission factors.

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

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

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.

Following the calculations of the DNA, and the statistical data available, Option I is chosen.

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

According to the tool, 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, 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.

- 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 (see enclosed EF calculation spreadsheet). Therefore, the project participants chose to use the simple OM method (option a).

The simple OM emissions factor can be calculated using either ex-ante or ex-post data vintages. The project participants have chosen to use the ex-ante option, and $EF_{grid,OM,y}$ is fixed for the duration of the first crediting period.

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.

The date of the submitted CDM-PDD for validation is 19/04/2012. The date of the publication of the most recent data for the calculation of the emission factor was 20/10/2011.[25]

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

(a) Simple OM

The simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (tCO2/MWh) of all generating sources serving the system, not including low-cost/must-run power plants/units.

The simple OM may be calculated by one of the following options:

Option A: Based on the net electricity generation and a 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 (i.e. if Option I has been chosen in Step 2).

The criteria for Option B are met, as (a) the necessary data for Option A is not available as indicated in the calculations of the DNA, (b) only nuclear and renewable power generation are considered as low-cost / must-run power sources and the quantity of electricity supplied to the grid by these sources is known, and (c) Option I is chosen in Step 2.

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

[25] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf, Department of Climate Change, NDRC, 2011-10-20.

According to the Tool, 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 total fuel consumption of the project electricity system, as follows:

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

Where:
$EF_{grid,OMsimple,y}$ is the simple operating margin CO2 emission factor in year y (tCO2/MWh)
$FC_{i,y}$ is the amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i,y}$ is the net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$ is the CO2 emission factor of fossil fuel type i in year y (tCO2/GJ)
EG_y is the net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)
i is all fossil fuel types combusted in power sources in the project electricity system in year y
y is the relevant year as per the data vintage chosen in Step 3

For this approach (simple OM) to calculate the operating margin, the subscript m refers to the power plants/units delivering electricity to the grid, not including low-cost/must-run power plants/units, and including electricity imports[26] to the grid. Electricity imports should be treated as one power plant m.

On the basis of the data available, the three-year average operating margin emission factor is calculated as a full-generation-weighted average of the emission factors:

$EF_{grid,OMsimple,y}$ = 1.0001 tCO2/MWh

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

In terms of vintage of data, the project participants chose the ex-ante option (as for the OM calculation), and $EF_{grid,BM,y}$ is fixed for the duration of the first crediting period:

Option 1: ex-ante. For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

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

[26] As described above, an import from a connected electricity system should be considered as one power source.

their annual electricity generation ($AEG_{SET-\geq 20\%}$, 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});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. In this case ignore steps (d), (e) and (f).

Following the deviation[27], the latest statistical data available (from the China Power Yearbook) is used by the DNA to determine the most recent year from which the added generation capacity is equal to or just exceeds 20% of the latest statistical year. The added generation capacity is the sample group of power units m used to calculate the build margin. This option comprises larger annual generation than the five units built most recently.

The build margin emissions factor is the generation-weighted average emission factor (tCO2/MWh) of all power units m during the most recent year y for which electricity generation data is available, calculated as follows:

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

Where:
$EF_{grid,BM,y}$ is the build margin CO2 emission factor in year y (tCO2/MWh)
$EG_{m,y}$ is the net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$ is the CO2 emission factor of power unit m in year y (tCO2/MWh)
m is the power units included in the build margin
y is the most recent historical year for which electricity generation data is available

The CO2 emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the guidance in Step 4 (a) for the simple OM, using options A1, A2 or A3, using for y the most recent historical year for which electricity generation data is available, and using for m the power units included in the build margin.

Due to the limited availability of data on individual power units, the DNA uses the deviation above to calculate the build margin emission factor and the CO2 emission factor of thermal power units as follows (with more detail presented in Annex 3 and the EF calculation spreadsheet):

- The added generation capacity is taken instead of generation in formula (5) above, as with the determination of the group of plant included in the build margin. Therefore, the calculation following the deviation is as follows:

$$EF_{grid,BM,y} = \sum_m (CAP_{m,y} \times EF_{EL,m,y}) / \sum_m CAP_{m,y} = \sum_m Share_{CAP,m,y} \times EF_{EL,m,y} \quad (5\text{-dev})$$

Where:
$EF_{grid,BM,y}$ is the build margin CO2 emission factor in year y (tCO2/MWh)
$CAP_{m,y}$ is the added generation capacity by plant type m in year y (MW)
$EF_{EL,m,y}$ is the CO2 emission factor of plant type m in year y (tCO2/MWh)
$Share_{CAP,m,y}$ is the share of added generation capacity by plant type m in year y (%)
m is the plant type included in the build margin (thermal, hydro, nuclear, other)
y is the most recent historical year for which electricity generation data is available

[27] Deviation for projects in China (DNV, 7 Oct 05), see http://cdm.unfccc.int/Projects/Deviations.

- The CO2 emission factor of plant types other than thermal power plants is taken as zero.
- The CO2 emission factor of thermal power plants is the weighted average emission factor of the best thermal power plant technologies commercially available in China, as required by the approved deviation, using option A2.

Using the equation of option A2, the CO2 emission factor of advanced (best commercially available) power plants using fuel type i can be calculated as follows:

$EF_{m,Adv,y} = EF_{CO2,m,y} \times 3.6 / \eta_{m,y}$

Where:
$EF_{m,Adv,y}$ is the CO2 emission factor of advanced power plants using fuel m in year y (tCO2/MWh)
$EF_{CO2,m,y}$ is the average CO2 emission factor of fuel type m in year y (tCO2/GJ)
$\eta_{m,y}$ is the average net energy conversion efficiency of advanced power plants using fuel type m in year y (%)
m is the fuel type of thermal plant (coal/solid, oil/liquid, gas)
y is the relevant year as per the data vintage chosen

The weighted average CO2 emission factor of thermal power plants is weighted on the basis of the emissions from each of these fuel types in the latest year for which data is available, and using the average net energy conversion efficiency for each fuel type of the best technologies commercially available in China.

$EF_{thermal,y} = \sum_m (EF_{m,Adv,y} \times \lambda_{m,y})$

Where:
$EF_{thermal,y}$ is the weighted average CO2 emission factor of thermal power plants in year y (tCO2/MWh)
$EF_{m,Adv,y}$ is the CO2 emission factor of advanced power plants using fuel type m in year y (tCO2/MWh)
$\lambda_{m,y}$ is the share of emissions of fuel type m in year y (%)
m is the fuel type of thermal plant (coal/solid, oil/liquid, gas)
y is the relevant year as per the data vintage chosen

The build margin emission factor is calculated using this methodology:

$EF_{grid,BM,y} = 0.5850$ tCO2/MWh

Step 6. Calculate the combined margin emission factor

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

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

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:

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

Option a is the preferred option. Option b can not be used as the proposed project activity does not take place in an LDC or in a country with less than 10 registered projects. Therefore option a is chosen.

(a) Weighted average CM

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (6)$$

Where
$EF_{grid,OM,y}$ is the operating margin CO2 emission factor in year y (tCO2/MWh)
w_{OM} is the weighting of operating margin emissions factor (%)
$EF_{grid,BM,y}$ is the build margin CO2 emission factor in year y (tCO2/MWh)
w_{BM} is the weighting of build margin emissions factor (%).

According to the Tool, the default values for w_{OM} and w_{BM} for the solar PV Power projects in the first crediting period and the subsequent crediting period are: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature).

On the basis of these weights for the first crediting period, the combined margin emission factor is calculated, and fixed ex-ante for the duration of the first crediting period (conservatively rounded down to the fourth digit) as given below and presented in the enclosed EF calculation spreadsheet.

	CO2 emission factor (tCO2/MWh)	Weighting (%)
Operating margin (see step 4)	1.0001	75%
Build margin (see step 5)	0.5850	25%
Combined margin	0.8963	

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

Baseline emissions (BE_y) now can be calculated as the annual net generation of the Proposed Project Activity (EG_y) multiplied by the combined margin CO2 emission factor ($EF_{grid,CM,y}$).

Leakage

According to the methodology, no leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, and transport). These emissions sources are neglected.

Emission reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad (7)$$

Where
ER_y is the emission reductions in year y (tCO2e)
BE_y is the baseline emissions in year y (tCO2)
PE_y is the project emissions in year y (tCO2e)

B.6.2. Data and parameters fixed ex ante

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

Data / Parameter	**$FC_{i,y}$**
Unit	Mass or volume.
Description	The amount of fossil fuel i consumed in the project/connected electricity system in year y.
Source of data	China Energy Statistical Yearbook.
Value(s) applied	See enclosed EF calculation spreadsheet.
Choice of data or Measurement methods and procedures	Data accepted and used by the DNA for the official emission factor calculations.
Purpose of data	Calculation of baseline emissions.
Additional comment	

Data / Parameter	**$NCV_{i,y}$**
Unit	GJ/mass or volume unit
Description	Net caloric value of fossil fuel type i consumed in the project/connected electricity system in year y
Source of data	China Energy Statistical Yearbook.
Value(s) applied	See enclosed EF calculation spreadsheet.
Choice of data or Measurement methods and procedures	National average default values, accepted and used by the DNA for the official emission factor calculations.
Purpose of data	Calculation of baseline emissions.
Additional comment	

Data / Parameter	**$EF_{CO2,i,y}$**
Unit	tCO2/GJ
Description	CO2 emission factor of fossil fuel type i in year y
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	See enclosed EF calculation spreadsheet.
Choice of data or Measurement methods and procedures	The IPCC default values at the lower level of 95% confidence interval are accepted and used by the DNA for the official emission factor calculations, and are the default value in the tool.
Purpose of data	Calculation of baseline emissions.
Additional comment	

Data / Parameter	EG_y
Unit	MWh
Description	Net electricity generated and delivered in the project electricity system in year y
Source of data	China Electric Power Yearbook
Value(s) applied	See enclosed EF calculation spreadsheet.
Choice of data or Measurement methods and procedures	Data accepted and used by the DNA for the official emission factor calculations
Purpose of data	Calculation of baseline emissions.
Additional comment	

Data / Parameter	$\eta_{fuel\text{-}type,y}$
Unit	%
Description	Average net energy conversion efficiency of the best technologies commercially available in China using solid, liquid and gas fuels
Source of data	Chinese DNA
Value(s) applied	See enclosed EF calculation spreadsheet.
Choice of data or Measurement methods and procedures	Data accepted and used by the DNA for the official emission factor calculations
Purpose of data	Calculation of baseline emissions.
Additional comment	

Data / Parameter	$Share_{CAP,m,y}$
Unit	%
Description	Share of added generation capacity by plant type m in year y
Source of data	Chinese DNA
Value(s) applied	See enclosed EF calculation spreadsheet.
Choice of data or Measurement methods and procedures	Data accepted and used by the DNA for the official emission factor calculations
Purpose of data	Calculation of baseline emissions.
Additional comment	

Following EB guidance, data that is calculated with equations provided in the methodology or default values specified in the methodology are not included in this compilation.

B.6.3. Ex ante calculation of emission reductions

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In accordance with the methodology, no leakage emissions are considered, and PE_y=0; Emission reductions are calculated as follows:

$ER_y = BE_y – PE_y$

Using the formulae presented in Section B.6.1., the baseline emissions are calculated from the net electricity supplied by the Proposed Project Activity to the grid and the combined margin emission factor of the grid. Based on the Feasibility Study Report, the average electricity generated of the proposed project in the first crediting period of 7 years is 51,914.12 MWh (with more detail presented in B.7.1); the combined margin emission factor is calculated in section B.6.1 above. The ex-ante calculations of baseline emissions and emission reductions, therefore, are as follows:

$BE_y = EG_{facility,y} \times EF_{grid,CM,y}$ = 51,914.12 MWh × 0.8963 tCO2/MWh = 46,530 tCO2
$ER_y = BE_y – PE_y$ = 46,530 – 0 = 46,530 tCO2

The ex-ante calculations of estimated emission reductions are included in the ER calculation spreadsheet.

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)
2012	47,674	0	0	47,674
2013	47,293	0	0	47,293
2014	46,912	0	0	46,912
2015	46,530	0	0	46,530
2016	46,149	0	0	46,149
2017	45,767	0	0	45,767
2018	45,386	0	0	45,386
Total	325,711	0	0	325,711
Total number of crediting years	7			
Annual average over the crediting period	46,530	0	0	46,530

Note: Using 12-monthly periods from the start of the crediting period, not calendar years.

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
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Electricity meters
Value(s) applied	See table below
Measurement methods and procedures	The following parameters will be measured: (i) The quantity of electricity supplied by the project plant/unit to the grid; and (ii) The quantity of electricity delivered to the project plant/unit from the grid. Two electricity meters (one main and one backup) recording supply and consumption at the onsite sub-station. Net generation calculated as quantity of electricity supplied by the project plant/unit to the grid minus and quantity of electricity delivered to the project plant/unit from the grid. The accuracy of the metering equipment is at least 0.5s. The CDM Manager of the Proposed Project Activity owned by the Developer is responsible for the monitoring and reporting.
Monitoring frequency	Continuous measurement and at least monthly recording
QA/QC procedures	Measurement results are cross-checked with records for sold electricity. The metering equipment is calibrated annually and checked for accuracy by a qualified third party in accordance with industry standards.
Purpose of data	Calculation of baseline emissions
Additional comment	The main and back-up electricity meters are installed at the onsite substation.

Year	Annual electricity generation (MWh)
1	53,190.70
2	52,765.17
3	52,339.65
4	51,914.12
5	51,488.60
6	51,063.07
7	50,637.55
Subtotal	363,398.86
Annual average over the crediting period	51,914.12

B.7.2. Sampling plan

>>

Not applicable. None of the data and parameters monitored in section B.7.1 above are to be determined by a sampling approach.

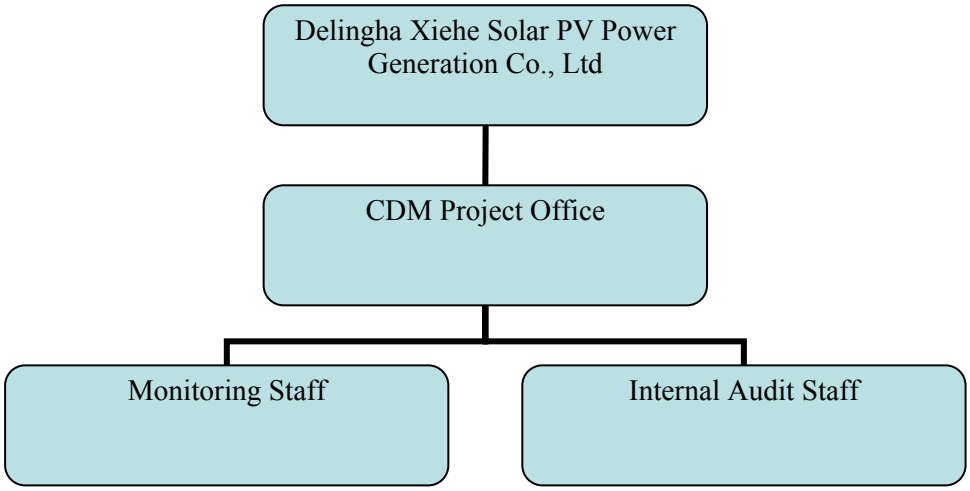
B.7.3. Other elements of monitoring plan

>>

I. Responsibility

The responsibility for monitoring lies with the Developer, who operates the proposed project activity. The company has established a CDM Project Management Office and assigned personnel to the monitoring and reporting tasks.

The CDM operating and management structure is illustrated as follows:



II. Training

Any personnel from the CDM Project Management Office requiring training will receive training as soon as practicable.

A CDM Manual will be compiled before generation of the proposed project activity.

III. Data and parameters to be monitored

The data and parameters to be monitored for the CDM project activity are listed in Section B.7.1. of this PDD:

- $EG_{facility,y}$: Net electricity supplied by the project activity to the grid, calculated from supply to the grid and imports from the grid using the main meter at the onsite substation.

The emission factor is determined ex-ante and fixed for the duration of the crediting period in this PDD.

Some parameters are monitored for purposes other than the CDM, in particular for ongoing for operational and maintenance requirements of the project.

IV. Installation of electricity meters

Both the main meter and back-up meter are installed in accordance with industry standards. The accuracy of the metering equipment is at least 0.5s, which is in line with the industry standards.

The exact metering arrangements will be defined in an agreement between the Developer and the grid company.

V. Compilation of the monitored data and dealing with errors

The Developer will receive the meter readings from the main and back-up meters. The meter readings from the main and back up meters as well as the volumes from the sales receipts are compiled and compared.

Should any previous months reading of the main meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the net generation output shall be determined by (a) first, by reading backup meter, unless a test by either party reveals it is inaccurate; (b) if the backup system is not with acceptable limits of accuracy or operation is performed improperly the Developer and grid company shall jointly prepare an reasonable and conservative estimate of the correct reading, and provide sufficient evidence that this estimation is reasonable and conservative for verification by the DOE; and (c) if the grid company and the Developer fail to agree then the matter will be referred for arbitration according to agreed procedures.

VI. Calibration

The metering equipment (main and backup) is calibrated annually and checked for accuracy by a qualified third party in accordance with industry standards.. Calibration records will be kept by the Developer for verification. The meters will be jointly inspected and sealed on behalf of the parties concerned and not be interfered with by either party except in the presence of the other party or its accredited representatives.

The exact metering arrangements, including maintenance and calibration frequencies of the meters, will be defined in an agreement between the Developer and the local grid company, which each being responsible for their own meters.

The meters installed shall be tested by qualified entity:

- before the end of the validity of the previous calibration certificate,
- after the detection of a difference larger than the allowable error in the readings of the meters, or
- after the repair of all or part of a meter caused by the failure of one or more parts to operate in accordance with the specifications.

If any errors are detected, the party owning the meter shall repair, recalibrate or replace the meter giving the other party sufficient notice to allow a representative to attend during any corrective activity.

VII. Quality control

The CDM Manager cross-checks meter readings from the main meter received and sales receipts.

The CDM manager also checks the validity of the calibration certificates of the electricity meters. If the data is correct and the meters calibrated, the data is approved, signed off and stored. If any errors are identified, such errors will be described and corrected, prior to approval, sign off and storage of the corrected data and error descriptions.

VIII. Reporting

The Monitoring Report will describe the monitoring procedures and the approved and signed off metering data, corrected errors, and the emission reduction calculations.

With the Monitoring Report, the calibration records are presented for verification.

IX. Record keeping

All data collected as part of the monitoring are archived electronically and kept at least for 2 years after the end of the last crediting period or the last issuance of CERs for this project activity, whichever occurs later.

SECTION C. Duration and crediting period
C.1. Duration of project activity
C.1.1. Start date of project activity
>>
05/07/2011

The starting date of a CDM project activity is the earliest of the date(s) on which the implementation or construction or real action of a project activity begins/has begun. The starting date of the proposed project activity is the date of the first contract.[28]

C.1.2. Expected operational lifetime of project activity
>>
25y-0m from commissioning.

C.2. Crediting period of project activity
C.2.1. Type of crediting period
>>
Renewable crediting period (first).

C.2.2. Start date of crediting period
>>
01/11/2012

C.2.3. Length of crediting period
>>
7y-0m

SECTION D. Environmental impacts
D.1. Analysis of environmental impacts
>>
An Environmental Impact Assessment (EIA) for the proposed project activity has been completed by Qinghai Academy of Environmental Science, and was approved by the Provincial Environmental Protection Bureau in 06/2011.

The main impacts identified in the EIA are summarised below.

Impacts during the construction period

- **Noise:** The noise from construction machines has some impact on the immediately surrounding area. However, there are no residential areas within 500m to the project site. Therefore, the negative impact is insignificant.
- **Waste water:** Both domestic waste water and process waste water will be produced from the project site. The main pollutant in the process waste water is suspended solids (SS), which is not harmful to the surrounding environment, the process waste water can be used directly for site

[28] Evidence of contracts signed are available to the DOE.

sprinkling. Domestic waste water will be treated through a septic tank and discharged into the surrounding grassland as gardening water, which will not cause negative impact to the local environment.

- **Solid Wastes:** The industrial wastes produced onsite are mainly waste soil and rock and construction wastes, which will be used for backfilling. Domestic solid wastes produced by onsite workers will be collected and be transferred to landfill for final treatment. Therefore, the negative impact is insignificant.
- **Ecosystem:** After the construction period, the Developer will re-plant the area in order to restore the ecosystem as quickly as possible.

Impacts during operational period

- **Domestic waste water and solid wastes:** Normal operation requires 18 onsite workers, who will produce an estimated small quantity of waste water per day. The waste water produced will be treated through a septic tank, and discharged into the grassland surrounded. Onsite domestic garbage will be collected and transferred to a landfill for final treatment. Therefore, the negative impact is insignificant.
- **Ecosystem:** During normal daily operation, vehicles will be prohibited from driving on the grassland onsite. The operating staff will monitor the condition of the grassland onsite and do vegetation recoveries work in time. On-site maintenance and inspection work shall be done in the daytime, and high noise levels will be avoided, so as to avoid normal activity of the animals in the area around the site. Therefore, the daily operation of the project will not make a significant impact on the living of the animals in the area.

Conclusion

Solar power is renewable energy and the impacts caused by solar PV power plants on the surrounding ecosystem, water, noise, and atmosphere environment is insignificant.

D.2. Environmental impact assessment

>>

Environmental impacts are not considered significant. Qinghai Environmental Protection Bureau has approved the EIA on 16 June 2011.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

In May 2011, staff from the Developer carried out a survey of the local villagers and residents near the project site. Questionnaires were sent to 50 stakeholders and the survey had a 100% response rate. The result of the survey indicated the support to the project.

The questionnaire was designed to be understandable and easy to fill in for the local stakeholders. The questionnaire included a short summary of the proposed project activity, questions about the responding stakeholder and a number of specific questions and the opportunity for further comments.

E.2. Summary of comments received

>>

Stakeholders surveyed

Stakeholder information		Number	Proportion
Gender	Male	12	24%
	Female	38	76%

Education	Elementary school	4	8%
	Junior high school	8	16%
	Senior high school	17	34%
	University or above	21	42%

Questions and responses

1. Will the project affect your environment of living, studying and working?	Yes	No	Not Sure
	0%	100%	0%
2. Will construction, operation or decommissioning of the project affect natural resources or ecosystems, such as water, habitats, etc?	Yes	No	Not Sure
	0%	100%	0%
3. Will the project cause noise, vibration or release of electromagnetic radiation that could adversely affect your health?	Yes	No	Not Sure
	0%	98%	2%
4. Do you think the proposed project will have a positive impact on local economic development?	Yes	No	Unclear
	100%	0%	0%
5. Do you agree with the development of the Project?	Yes	No	No Concern
	100%	0%	0%

No further comments were given.

Conclusions from the survey

The survey shows that the proposed project has strong support among the local stakeholders. They all believe the proposed project will promote the local economic development and agree the project construction.

E.3. Report on consideration of comments received

>>

The local stakeholders are supportive of the proposed project activity, and there have been no comments to be taken in account that could affect the project design.

SECTION F. Approval and authorization

>>

The letters of approval from Parties for the project activity were not available at the start of validation and have been provided during the validation activities.

- - - - -

Appendix 1: Contact information of project participants

Organization name	Delingha Xiehe Solar PV Power Generation Co., Ltd
Street/P.O. Box	No. 9 Shoutinan Road, Haidian District,
Building	
City	Beijing
State/Region	
Postcode	100048
Country	People's Republic of China
Telephone	+86 10 88317846
Fax	+86 10 88317777-7846
E-mail	
Website	
Contact person	Du Shuyao
Title	
Salutation	Mr.
Last name	Du
Middle name	
First name	Shuyao
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	dusy@cwpgroup.com.hk

Organization name	Carbon Resource Management S.A.
Street/P.O. Box	Boulevard du Pont d'Arve 28 / P.O. Box 384
Building	
City	Geneva 4
State/Region	
Postcode	1211
Country	Switzerland
Telephone	+41 22 322 1189
Fax	+41 22 781 6611
E-mail	deliveries@carbonresource.com
Website	
Contact person	
Title	Chief Operating Officer
Salutation	Dr
Last name	Green
Middle name	
First name	John
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	deliveries@carbonresource.com

Appendix 2: Affirmation regarding public funding

Not applicable.

Appendix 3: Applicability of selected methodology

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

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

BASELINE INFORMATION

Step 1. Identify the relevant electricity systems

Following the DNA delineation, the project electricity system is the Northwest Power Grid (NWPG), consisting of five provincial grids: Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang.

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

See B.6. Option I is chosen: only grid power plants are included in the calculation.

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

Table A1 Low-cost/must-run generation in the project electricity system in the five most recent years

Year	Low-cost/must-run generation	Total generation	Share
	10^8kWh	10^8kWh	
2005	437.23	1,724.04	25%
2006	490.53	1,984.91	25%
2007	532.34	2,299.38	23%
2008	584.40	2,673.27	22%
2009	718.78	2,879.95	25%
Total	2,763.28	11,561.55	24%
Average	552.66	2,312.31	24%
Source: China Power Year Book (2006/p568) (2007/p638) (2008/p733) (2009/p695) (2010/p730)			
Note: Only nuclear/renewables are considered low-cost/must-run			

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

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

Table A2 Net calorific value and CO2 emission factor of fossil fuels

Fuel	Net Calorific Value		CO_2 emission factor*	
Solids				
Raw coal	20,908	kJ/kg	87,300	$kgCO_2/TJ$
Clean coal	26,344	kJ/kg	87,300	$kgCO_2/TJ$
Moulding coal	20,908	kJ/kg	87,300	$kgCO_2/TJ$
Other washed coal	8,363	kJ/kg	87,300	$kgCO_2/TJ$
Coke	28,435	kJ/kg	95,700	$kgCO_2/TJ$
Other coking products	28,435	kJ/kg	95,700	$kgCO_2/TJ$
Liquids				
Crude oil	41,816	kJ/kg	71,100	$kgCO_2/TJ$
Gasoline	43,070	kJ/kg	67,500	$kgCO_2/TJ$
Diesel	42,652	kJ/kg	72,600	$kgCO_2/TJ$
Fuel oil	41,816	kJ/kg	75,500	$kgCO_2/TJ$
Other petroleum products	41,816	kJ/kg	72,200	$kgCO_2/TJ$
Gases				
Natural gas	38,931	kJ/m^3	54,300	$kgCO_2/TJ$
Coke oven gas	16,726	kJ/m^3	37,300	$kgCO_2/TJ$
Other gas	5,227	kJ/m^3	37,300	$kgCO_2/TJ$
LPG	50,179	kJ/kg	61,600	$kgCO_2/TJ$
Refinery gas	46,055	kJ/kg	48,200	$kgCO_2/TJ$
Other energy	0	kJ/kg	0	$kgCO_2/TJ$

Sources: NCV from China Energy Statistical Year Book 2010, p285; CO_2 emission factor from the Chinese DNA (also 2006 IPCC Guidenlines for National Greenhouse Gas Inventories, Vol 2 (Energy), Chapter 1, Tables 1.3 and 1.4)

*Note: * Using IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories*

Fossil fuel consumption

Fuel consumption is taken from the latest China Energy Statistical Yearbook editions. The yearbooks present a range of more than 10 fuels for each province. Data is presented in Table A3 below.

Table A3 Fuel consumption in thermal power generation in the project electricity system in the three most recent years

Fuel	Unit	2007	2008	2009	Total
Raw coal	10^4 t	9,671.23	10,599.96	11,206.40	31,477.59
Clean coal	10^4 t	-	-	-	-
Other washed coal	10^4 t	135.77	71.27	71.01	278.05
Moulding coal	10^4 t	3.53	-	-	3.53
Coke	10^4 t	-	-	-	-
Coke oven gas	10^8 m^3	1.43	1.22	1.41	4.06
Other gas	10^8 m^3	14.85	18.58	18.81	52.24
Crude oil	10^4 t	0.09	-	-	0.09
Gasoline	10^4 t	0.02	0.06	0.02	0.10
Diesel	10^4 t	3.57	3.42	2.09	9.08
Fuel oil	10^4 t	1.15	0.92	0.39	2.46
LPG	10^4 t	-	-	0.02	0.02
Refinery gas	10^4 t	5.99	7.25	8.56	21.80
Natural gas	10^8 m^3	12.76	11.37	12.74	36.87
Other petroleum products	10^4 t	-	0.01	-	0.01
Other coking products	10^4 t	-	-	-	-
Other E (standard coal)	10^4 tce	104.09	125.49	110.36	339.94

Sources: DNA; and China Power Year Book (2008, 2009, 2010)

Emissions from fossil fuel consumption

The emissions from this fuel use are calculated using the following formula, and are presented in Table A4:

$CO2\ emissions = \sum_i (FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y})$

Table A4 Emissions from thermal generation in the project electricity system in the three most recent years

Fuel	2007	2008	2009	Total
Raw coal	176,525,905	193,477,720	204,546,878	574,550,503
Clean coal	-	-	-	-
Other washed coal	991,243	520,335	518,437	2,030,015
Moulding coal	64,432	-	-	64,432
Coke	-	-	-	-
Coke oven gas	89,215	76,113	87,967	253,295
Other gas	289,526	362,249	366,733	1,018,508
Crude oil	2,676	-	-	2,676
Gasoline	581	1,744	581	2,907
Diesel	110,546	105,902	64,718	281,165
Fuel oil	36,307	29,045	12,313	77,665
LPG	-	-	618	618
Refinery gas	132,969	160,939	190,019	483,928
Natural gas	2,697,404	2,403,565	2,693,177	7,794,146
Other petroleum products	-	302	-	302
Other coking products	-	-	-	-
Other E (standard coal)	-	-	-	-
Total	180,940,805	197,137,915	208,481,441	586,560,160

Calculation of net generation from included sources

Gross generation for each province is presented in the yearbooks. The data is broken down into three categories: thermal, hydro and other sources. For the OM calculations, only thermal generation is included. In addition, the yearbooks present own consumption of plant from the three different generator categories. Gross generation and own consumption are used to calculate net generation from included sources. The calculations are presented in Table A5 below.

Table A5 Thermal generation, own consumption rate, and net supply in the project electricity system in the three most recent years

	2007		
Region	Gross generation (10^8kWh)	Own use (%)	Net Generation (10^8kWh)
Shaanxi	591	6.77	550.99
Gansu	424	5.89	399.03
Qinghai	97	7.19	90.03
Ningxia	435	-	435.00
Xinjiang	346	9.20	314.17
NWPG			1,789.21
	2008		
Region	Gross generation (10^8kWh)	Own use (%)	Net Generation (10^8kWh)
Shaanxi	715	6.95	665.31
Gansu	468	6.40	438.05
Qinghai	107	7.14	99.36
Ningxia	440	7.57	406.69
Xinjiang	397	-	397.00
NWPG			2,006.41
	2009		
Region	Gross generation (10^8kWh)	Own use (%)	Net Generation (10^8kWh)
Shaanxi	774	7.24	717.96
Gansu	441	6.88	410.66
Qinghai	107	7.01	99.50
Ningxia	447	7.76	412.31
Xinjiang	452	5.16	428.68
NWPG			2,069.11
Sources: DNA; and China Power Year Book (2008, 2009, 2010)			

Calculation of the simple OM

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

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

Table A6 Operating margin emission factor calculation for the project electricity system

	2007	2008	2009	Total / 3-year average
CO_2 emissions (tCO_2)	180,940,805	197,137,915	208,481,441	586,560,160
Net generation (MWh)	178,920,940	200,640,770	206,911,050	586,472,760
EF_OM	1.0113	0.9825	1.0076	1.0001

Based on above data, the simple OM emission factor of NWPG is calculated ex-ante using a 3-year generation-weighed average is 1.0001tCO_2e/MWh.

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

Using the latest statistical data available (from the China Electric Power Yearbook) determine the year from which the added generation capacity is equal to or just exceeds 20% of the latest statistic year. The group does not include units that are built more than 10 years ago.

Table A7 Identification of the share of added generation capacity in the project electricity system by plant type

		Added since		
	Capacity 2009	2008	2007	Share of additions
Plant type m		($CAP_{m,2008-2009}$)	($CAP_{m,2007-2009}$)	($Share_{CAP,m,2007-2009}$)
Thermal	51,160	7,389	16,998	74.07%
Hydro	19,460	3,680	4,870	21.22%
Nuclear	-	-	-	0.00%
Wind and other	1,880	600	1,082	4.71%
Total	72,500	11,669	22,950	100%
Share of recent additions		16.10%	31.65%	
Selected		No	Yes	
Source: China Electric Power Yearbook (2008, 2009, 2010)				

Table A8 CO2 emissions of each main fuel in NWPG in Year 2009

	Emissions	Share
Fuel type	(tCO_2e)	$\lambda_{m,y}$
Solid	205,065,315	98.36%
Liquid	77,612	0.04%
Gas	3,338,514	1.60%
Total	208,481,441	100%

Due to the limited availability of data on individual power units, the DNA uses the deviation described to calculate the CO2 emission factor of thermal power units and the build margin emission factor.

First, the CO2 emission factor used is the weighted average emission factor for thermal power plant calculated from the average net energy conversion efficiency of the best technologies commercially available in China for solid, liquid and gas fuels, weighted on the basis of the emissions from each of these fuel types in the latest year for which data is available.

Table A8 CO2 emission factor of the best commercially available power plants by fuel in China

Plant type m	Best efficiency	CO_2 emission factor ($EF_{CO2,m,y}$)	$EF_{m,Adv,y}$
	$\eta_{m,y}$	$kgCO_2/TJ$	tCO_2e/MWh
Coal/solid	39.45%	87,300	0.7967
Oil/liquid	51.77%	75,500	0.5250
Gas	51.77%	54300	0.3776
Source:http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf			
Note:* Using IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories			

The fuel emission shares in the latest year, λ, are calculated from the emissions presented in Table A4

above, and multiplied with the emission factor of the best commercially available technologies, to find the weighted average emission factor for thermal power plants.

Table A9 Weighted average emission factor for thermal power plant in the project electricity system in the build margin

Plant type m	$EF_{m,Adv,y}$	Share	$EF_{thermal,y}$
	tCO_2e/MWh	λ	tCO_2e/MWh
Coal/solid	0.7967	98.36%	-
Oil/liquid	0.5250	0.04%	-
Gas	0.3776	1.60%	-
Thermal	-	-	0.7898

Secondly, the added generation capacity is taken instead of generation, as with the determination of the cohort of plant included in the build margin.

Table A10 Build margin emission factor calculation for the project electricity system

Plant type m	$Share_{CAP,m,2007-2009}$	$EF_{thermal,y}$	$EF_{grid,BM,y}$
	%	tCO_2e/MWh	tCO_2e/MWh
Thermal	74.07%	0.7898	
Hydro	21.22%		
Nuclear	0.00%		
Wind and other	4.71%		
Total	100%		0.5850

Step 6. Calculation of the combined margin emission factor

Option a – Weighted average CM

The combined margin emission factor is calculated using the weights as specified, and rounded to the fourth digit.

Table A12 Combined margin emission factor calculation for the project electricity system

EF (NWPG)	Value	Weight
OM	1.0001	75%
BM	0.5850	25%
CM	0.8963	-
(rounded down to 4th digit)		

Appendix 5: Further background information on monitoring plan

The information used in the development of the monitoring plan is described in B.7.

Appendix 6: Summary of post registration changes

Not applicable.

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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		