CLEAN DEVELOPMENT MECHANISM

PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

Title: Shaanxi Dongling Smelting Waste Heat Recovery Project.

Version: 2.0

Date: 24/02/2011

History of version:

PDD Version 1.0 Write according to the methodology ACM0012 Version 3.2
PDD Version 2.0 Write after on-site validated by JCI

A.2. Description of the project activity:

Dongling 20MW Waste Energy Recovery and Utilization Power Generation Project (hereafter referred to as "the proposed project") is located in the Changqing Industrial Park, Fengxiang County, Baoji City, Shaanxi Province, China. It is constructed and operated by Shaanxi Dongling Smelting Co., Ltd. (hereafter referred to as "SDS"). The waste gas containing waste energy is from SDS started on 2003 and was in operation since 2007, it has the capacity of 700,000 tonnes/yr of Cokes production, 67,000 tonnes/yr of Zinc, 33,000 tonnes/yr of Lead, 150,000 tonnes/yr of Vitriol. It's the only company of combined coking and smelting in China.

The proposed project will involve the utilisation of waste blast furnace gas (BFG), waste coke oven gas (COG) , cooling chute of Lead & Zinc smelting (CLZ) and waste fuming furnace gas(FFG) at Dongling Smelting Facility in Shaanxi Province to generate electricity. The purpose of the project is to generate electricity using waste heat and to export the electricity to the North West Power Grid (NWPG) on the basis of Power Purchase Agreement (PPA).

The proposed project will install waste heat boilers, together with one set of turbine generator. This will provide an installed electricity generation capacity of 20MW and an estimated annual gross electricity production of 147 GWh. The total net generation is estimated as 135 GWh. All of the net electricity produced will be supplied to the Shaanxi Power Grid which is a constituent of North West Power Grid.

The electricity generated by the project will therefore effectively replace the equivalent electricity generated by the North West Power Grid by coal-fired power plant. The proposed project is expected to achieve greenhouse gas (GHG) reduction by avoiding CO_2 emissions from electricity generation in grid-connected fossil fuel power plants, which presently are dominated and supply the North West China Grid. The yearly estimated emission reductions are 112,910 tCO_2e.

The project complies with the national industrial policy and has contribution to sustainable development of energy industry with good environmental and social benefit. The proposed project activity contributes significantly to the region's sustainable development in the following ways:

- Improving energy efficiency of the Coking and Smelting industry in Shaanxi province in general through demonstration efficient technology and improving energy efficiency (i.e. utilization of surplus waste gases) at Dongling in particular;
- Reducing the reliance on fossil fuels and reducing the emission of local pollutants caused by the burning fossil fuel and the associated adverse health impact.
- Reducing the environmental pollution caused by the existing open flaring system.

- Reducing the greenhouse gas emission caused by displaying part of fossil fuel-fired power in the NWPG, reducing the environmental pollution generated from burning coal.
- Meanwhile, the project will provide employment opportunities for local community during the construction and distribution.

A.3. Project participants:

Name of Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants(as applicable)	Kindly indicate if the Part involved wishes to be considered as project participant (Yes/ No)
P.R. China(host)	Shaanxi Dongling Smelting Co., Ltd	No
Japan	Tepia Corporation Japan Co., Ltd.	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party (ies):

The Peoples' Republic of China

A.4.1.2. Region/State/Province etc.:

Shaanxi Province

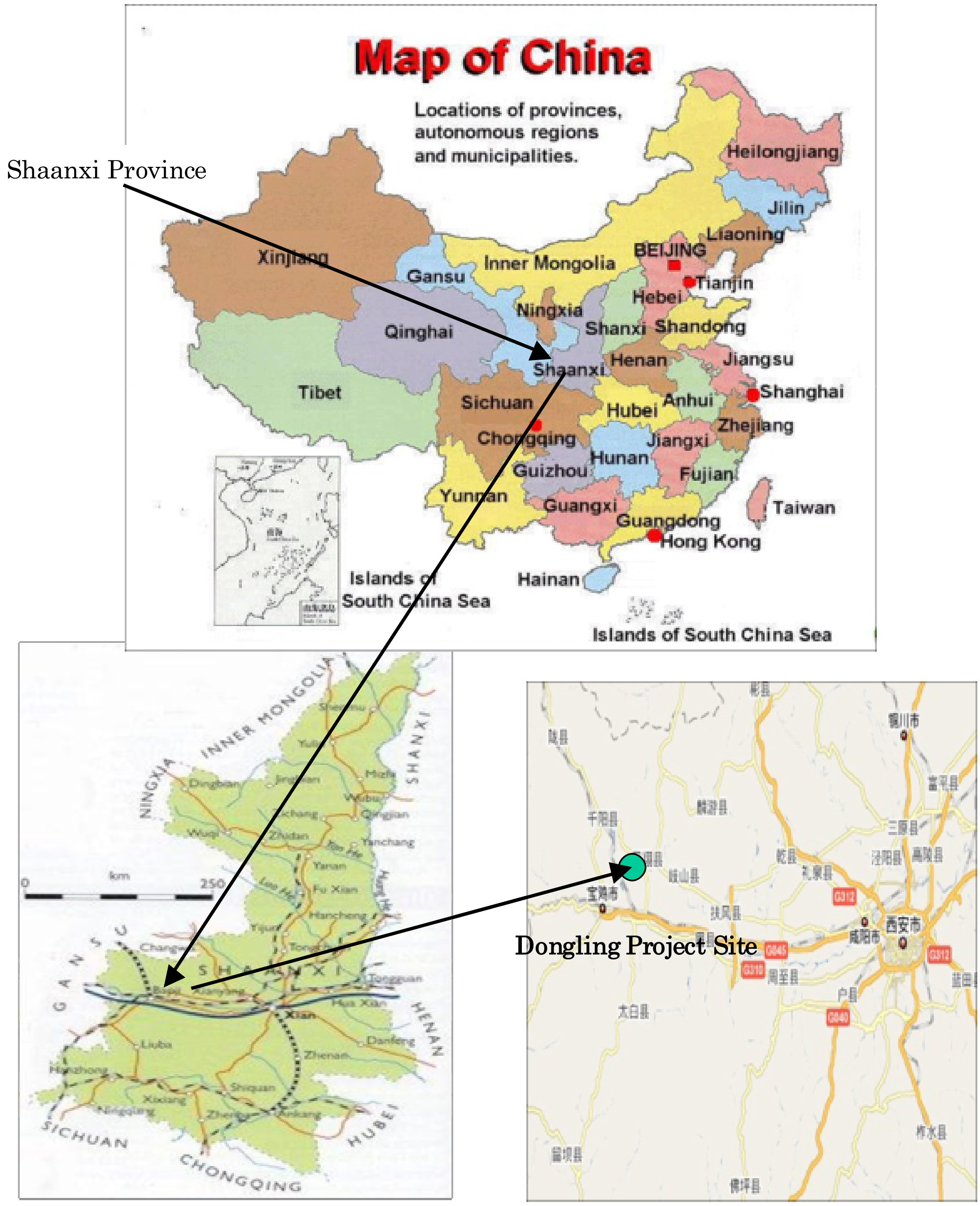
A.4.1.3. City/Town/Community etc.:

Fengxiang County, Baoji City.

A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):

The proposed project is located in SDS, Changqing Industrial Park, Changqing Town, Fengxiang County, Baoji City, Shaanxi Province, China. It is 20 km from the Baoji City, and the exact location of the turbine and generator is at the longitude of 107˚14′37″, and latitude of 34˚28′04″.

The location map of the project is below figure A.1.



Shaanxi Province Baoji City

Figure A.1 The location map of the project

A.4.2. Category (ies) of project activity:

The proposed project activity falls under the category described under CDM as "Sectoral Scope Number 1: Energy industries".

A.4.3. Technology to be employed by the project activity:

The waste energy recovered and utilized in the proposed project activity is from the waste blast furnace gas (BFG), waste coke gas (COG), cooling of Lead and Zinc smelting (CLZ), waste fuming furnace gas(FFG) that belong to Dongling Smelting Co., Ltd.

There are four different kinds of waste energy are utilized to generate steam for the electricity generation, so the process is complicated.

Figure A.2 COG flare in SDS site

It's estimated that the surplus quantity of waste blast furnace is 23,000 Nm^3/h, and the surplus quantity of waste coke oven gas is 11,000 Nm^3/h. After treatment to remove the dust, the waste BFG and COG will be fired to heat gas-fired boiler, which will generate intermediate pressure and high temperature steam. The steam will be used to drive steam turbine and steam generator, generating electricity. The smelted Lead or Zinc will release utilized waste heat from the installed cooling equipment, and the fuming furnace installed waste heat boiler will recover the heat. Both of the waste heat from CLZ and FFG will be delivered to the boiler to produce steam for electricity generation. The generation system adopted modern Air-cooling equipment, which is consisted of 8 sets of 55 kW Fan. Despite increasing investment, it has a good effect and saves on water. Other main equipments are all ordered.

Table A.1 The specified technical parameters of main equipment

name	Mail Technical Parameters	Description
Gas Fired Boiler	Units	1
	Type	JG-90/5.3-Q
	Manufacturer	Jiangxi Jianglian Energy Environment Co., Ltd
	Rated Evaporation Capacity	90t/h
	The Temperature of Over Heated Steam Exit	450˚C
	The Pressure of Over Heated Steam Exit.	5.3MPa

name	Mail Technical Parameters	Description
	The Supplied Water Temperature	200˚C
	Main Fuel	COG/BFG
Steam Turbine	Units	1
	Type	K(C)-20-4.9/0.7
	Manufacture	Qingdao Jieneng Steam Turbine Group Co., Ltd.
	Rated Capacity	20MW
	Rated Intake Pressure	4.9MPa(A)
	Rated Intake Temperature	435˚C
	Rated Extraction Pressure	0.6~0.8MPa(A)
	Rated intake Quantity	90t/h
	Rated Extraction Quantity	0~35t/h
Generator	Type	QF-25-2
	Manufacture	Hangzhou Hangfa Electrical Equipment Co., Ltd.
	Rated Capacity	25MW
	Rated Voltage	10.5kV
	Rated Rotate Speed	3000r/min

The proposed project will install waste heat boiler to recover the waste heat contained in the flue gases to produce steam for electricity generation. Steam from boiler will be used to drive turbines and generator. The power generated will be delivered to the NWPG.

The main process is as follow:

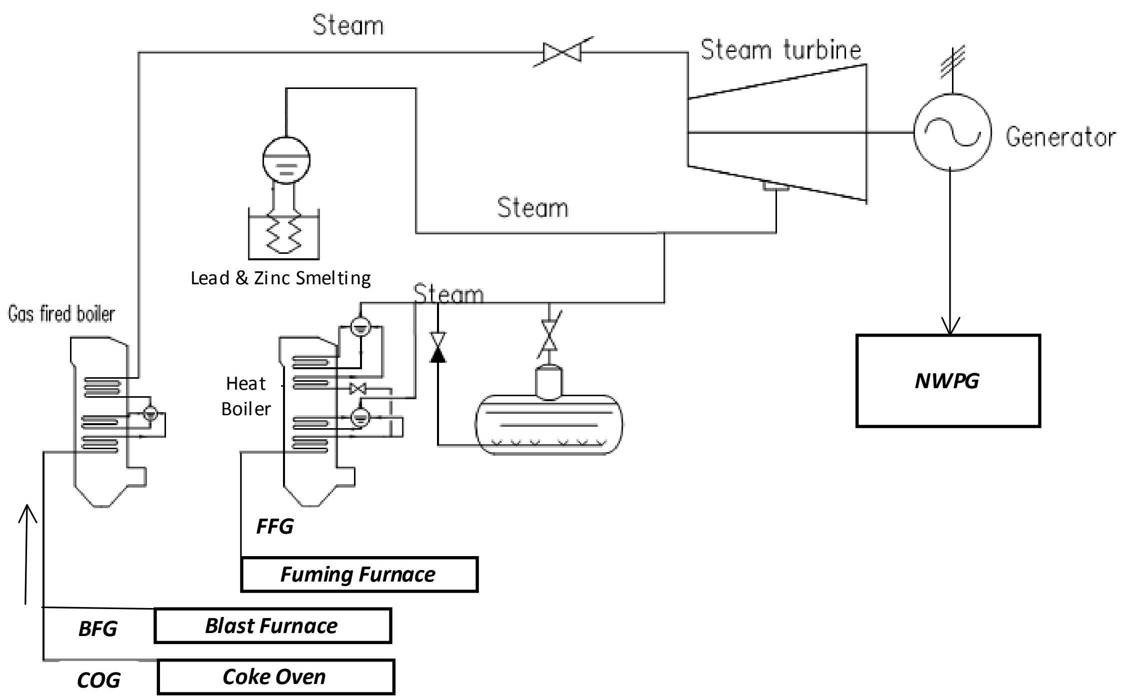


Figure A.3 Flow chat of the proposed project

There is no other technology transfer due to all the technology and equipment employed is domestic. The above Figure A.3 shows the process of the proposed project activity.

The employees have been trained before the operation and taken an examination, only the workers who passed the examination could be involved in the operation work. Furthermore, the project owner set a series of regulations to guarantee normal operating and maintenance of the project, such as, management standard, safety management standard, safety production, emergency plan, technology management standard, operation skill standard for employees, and so on.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

The proposed project activity uses the fixed crediting period (10years), and estimation of the emission reductions in the crediting period (from Jan, 1, 2012 to Dec, 31, 2021) is present in Table A.2. Estimated Emission Reductions throughout the crediting period are 1,129,100tCO_2e.

Table A.2 The Estimation of the Emission Reductions in the Crediting Period.

Years	**Annual estimation of emission reduction in tonners of CO_2e**
Jan, 1, 2012- Dec, 31, 2012	112,910
Jan, 1, 2013- Dec, 31, 2013	112,910
Jan, 1, 2014- Dec, 31, 2014	112,910
Jan, 1, 2015- Dec, 31, 2015	112,910
Jan, 1, 2016- Dec, 31, 2016	112,910
Jan, 1, 2017- Dec, 31, 2017	112,910
Jan, 1, 2018- Dec, 31, 2018	112,910
Jan, 1, 2019- Dec, 31, 2019	112,910
Jan, 1, 2020- Dec, 31, 2020	112,910
Jan, 1, 2021- Dec, 31, 2021	112,910
Total estimated reductions (tonnes of CO_2e)	1,129100
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**112,910**

A.4.5. Public funding of the project activity:

There is no public funding from Annex 1 countries available for the project. The following Figure shows the process of the proposed project activity.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

Title: “Consolidated baseline methodology for GHG emission reduction from waste gas or waste energy recovery projects”

Reference: Approve Consolidated Baseline and Monitoring Methodology ACM0012, Version 03.2, sectoral Scope 01 and 04, EB 51.

Additionality of the project has been justified using the approved "Tool for the demonstration and assessment of additionality", Version 05.2, EB 39.

The latest version of the "Tool to calculate the emission factor for an electricity system", version 02, EB50.

It has been referred from the list of approved methodologies for CDM project activities in the UNFCCC CDM website (http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html)

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

According to ACM0012, the methodology is for the following types of project activities:

- Type-1: All the waste energy in identified WECM stream/s that will be utilized in the project activity is, or would be flared or released to atmosphere in the absence of the project activity at the existing or new facility. The waste energy is an energy source for:
  - Cogeneration; or
  - Generation of electricity; or
  - Direct use as process heat source; or
  - For generation of heat in element process (e.g. steam, hot water, hot oil, hot air); or
  - For generation of mechanical energy.
- Type-2: An existing industrial facility, where the project activity is implemented, that captures and utilizes a portion of the waste gas stream(s) considered in the project activity, and meet the following criteria:
  - The project activity is to increase the capture and utilization of waste gas for generation of electricity that is flared or vented in the absence of the project activity, and not only the placement/modification/expansion of existing generation equipment with or to a more efficient equipment;
  - The portion of waste gas captured prior to implementation of the project activity is used for generation of captive electricity. The use of a portion of the waste gas in the baseline for the purpose of heat generation or other use prior to implementation of the project activity is also permitted under this methodology provided the generation of heat or other use in crediting period remain same as that in the baseline;
  - If the project participant uses a part of the electricity generated in the project activity onsite and exports the remainder, both shall be monitored. In such situations it shall be demonstrated that the electricity generated for own consumption from waste gas is not reduced in the activity;
  - Emission reductions generated in the project activity are attributable to the amount of waste gas captured and utilized in the project activity that is was flared or vented in the absence of the absence of the project activity and to the increase in energy efficiency of the new power generating facility;
  - No auxiliary fossil fuel (except start-up fuel) is in the waste gas boiler for the generation of captive electricity in the absence of the project.

For project activities that use waste pressure, the consolidated methodology is applicable where waste pressure is used to generate electricity only.

The proposed project activity recovers and utilizes the waste energy from the BFG, COG, CLZ and FFG to generate electricity to substitute part electricity generation with fossil fuels in North West Power Grid. There is no equipment for waste heat recovery from the BFG, COG, and CLZ are implemented prior to the start of the project activity, just a waste heat boiler after FFG. All the waste energy in the identified WECM stream would be flared in absence of the proposed CDM project activity at the new facility. Thus, according to the description above, the project activity is one of the Type-1 projects.

The table B.1 below shows the reason for why the methodology is applicable to the project activity.

Table B.1 Reason for the applicability to project activity

No.	Applicability Conditions as per ACM0012	Project Activity
1	If the project activity is based on the use of waste pressure to generate electricity, electricity generated using waste pressure should be measurable.	This project activity does not involve the use of waste pressure.
2	Energy generated in the project activity may be used within the industrial facility or exported outside the industrial facility;	The electricity generated in this project activity is exported outside the industrial facility.
3	The electricity generated in the project activity may be exported to the grid or used for captive purposes;	The electricity generated in the project activity will be exported to the North West Power Grid through Shaanxi provincial Power Grid.
4	Energy in the project activity can be generated by the owner of the industrial facility producing the waste energy or by a third party (e.g. ESCO) within the industrial facility.	The energy in the project activity is generated by SDS, not the third party within the industrial facility.
5	Regulations do not constrain the industrial facility generating waste energy from using the fossil fuels prior to the implementation of the project activity.	There are not such regulations which constrain the industrial facility generating the waste gas from fossil fuels being used before implementation of the project activity in China.
6	The methodology covers both new and existing facilities. For existing facilities, the methodology applies to existing capacity. If capacity expansion is planned, the added capacity must be treated as a new facility.	This applicability condition is met because this project activity is a new facility, which is covered by the methodology.
7	The emission reductions are claimed by the generator of energy using waste energy.	The emission reductions are claimed by the owner of the waste heat recovery power plant which generates electricity.
8	In cases where the energy is exported to other facilities, an official agreement exists between the owners of the project energy generation plant (henceforth referred to as generator, unless specified otherwise) with the recipient plant(s) that the emission reductions would not be claimed by recipient plant(s) for using a zero-emission energy source	The energy generated by the proposed project activity, electricity, is exported to the North West Power Grid and the gird will not claim the credits by the proposed project activity.

No.	Applicability Conditions as per ACM0012	Project Activity
9	For those facilities and recipients, included in the project boundary, which prior to implementation of the project activity (current situation) generated energy on-site (sources of energy in the baseline), the credits can be claimed for minimum of the following time periods: 1). The remaining lifetime of equipments currently being used; and 2). Credit period.	In the project activity, all the equipments are new installation and the lifetime is longer than the credit period of 10 years[1]. Hence the credit period is 10 years.
10	Waste energy that is released under abnormal operation (for example, emergencies, shut down) of the plant shall not be accounted for.	Any waste heat is released under abnormal operation of the plant, shall not be accounted for.
11	It shall be demonstrated that the waste energy utilized in the project activity was flared or released into the atmosphere (or wasted in case of project activity recovering waste pressure) in the absence of the project activity at the existing facility by either one of the following ways. ●By direct measurements of the energy content and amount of the waste energy produced for at least three year prior to the start of the project activity; ●Proving an energy balance of the relevant sections of the plant to prove that the waste energy was not a source of energy before the implementation of the project activity. For the energy balance applicable process parameters are required. The energy balance must demonstrate that the waste energy was not used and also provide conservative estimations of the energy content and amount of waste energy released. ●Energy bills (electricity, fossil fuel) to demonstrate that all the energy required for the process (e.g. based on specific energy consumption specified by the manufacturer) has been procured commercially. Project participants are required to demonstrate through the financial documents (e.g. balance sheets, profit and loss statement) that no energy was generated by waste energy and sold to other facilities and/or the grid. The bills and financial statements should be audited by competent authorities; ●Process plant manufacturer's original design specifications and layout diagrams from the facility could be used as an estimate of the quantity and energy content of the waste energy produced for the rated plant capacity/per unit of product produced; ●On site checks conducted by the DOE prior to	The waste energy from the industrial facilities would be flared in the absence of the proposed project activity. This will be proved by the process plant manufacturer's original specification, schemes and diagrams from the construction of the facility is used to estimate the content of waste heat produced for the rated plant capacity/per unit of product.

[1] Source from the parameter of mail equipment of the proposed project.

No.	Applicability Conditions as per ACM0012	Project Activity
	project implementation can confirm that no equipment for waste energy recovery and utilization, on the WECM stream recovered under the project activity, had been installed prior to the implementation of the CDM project activity.	

Based on the above analysis, it can therefore be concluded that the project activity meets all the applicability conditions required by methodology ACM0012. And also the baseline scenario identified in the section B.4 is also in line with the methodology ACM0012 version 03.2.

B.3. Description of the sources and gases included in the project boundary:

According to ACM0012, the geographical extent project boundary shall include the following:

1. The industrial facility where waste energy is generated, including the part of the industrial facility where the waste gas was utilized for generation of captive electricity prior to implementation of the project activity:
2. The facility where process heat in the element process/steam/electricity/mechanical energy is generated (generator of process heat/steam/electricity/mechanical energy). Equipment providing auxiliary heat to the waste energy recovery process shall be included within the project boundary; and
3. The facility/s where the process heat in the element process/steam/electricity/mechanical energy is used (the recipient plant(s) and/or grid where electricity is exported. If applicable."

Spatial extent of the grid is as defined in the "Tool to calculate the emission factor for an electricity system". The spatial extent of the project boundary includes the project sit and all power plants connected physically to the electricity system that the CDM project power plant is connected to."

In terms of the proposed project, the waste energy generated from the blast furnace gas (BFG), coke oven gas (COG), cooling of Lead and Zinc smelting (CLZ)**,** fuming furnace gas (FFG) will be respectively delivered to the Gas Fired Boiler, cooling equipment and waste heat boiler, and then delivered to the steam turbines and the generators, auxiliary power consumer units and all the power plants physically connected to NWPG. The proposed project is sited in Shaanxi Province, which belongs to NWPG, whose geographical range covers Shaanxi Province, Gansu Province, Qinghai Province, Ningxia Hui Nationality Autonomous Region, and Xinjiang Uygur Autonomous Region. Electricity from the proposed project will be transmitted to Shaanxi Provincial Power Grid and then merge red into NWPG. Hence, the geographical extent project boundary shall include the gas fired boiler, cooling equipment, the turbine and generator and all the power plants physically connected to Northwest Power Grid as shown within the dashed frame in Figure B.1.

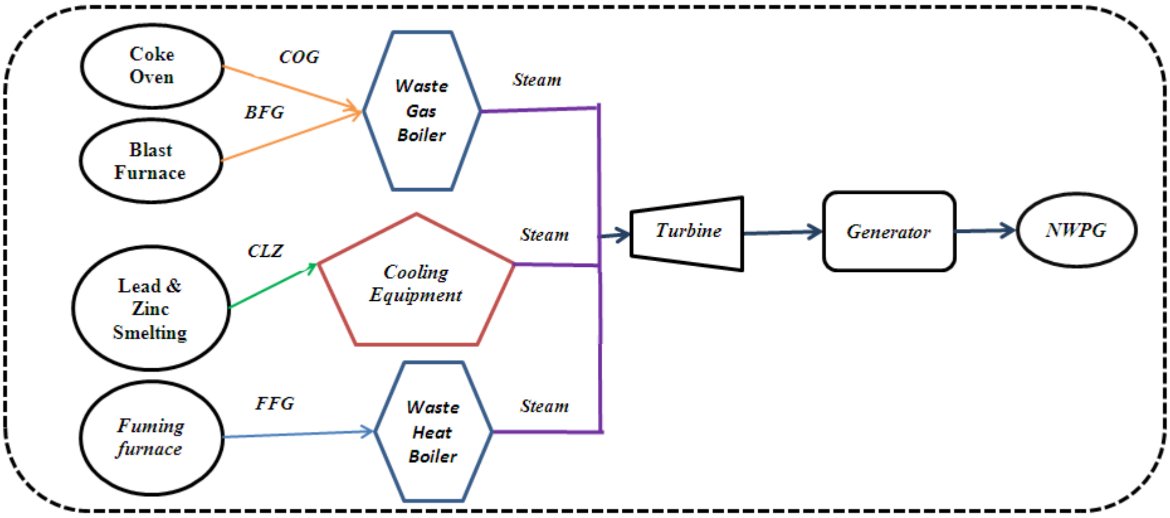


Figure B.1 project boundary

The following table B.1 illustrates which emission sources are included and which are excluded from the project boundary for determination of both baseline and project emissions.

Table B.2 Emission sources for the proposed project activity

	Source	Gas	Included?	Justification/Explanation
Baseline	Grid electricity generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
	Fossil fuel consumption in boiler for thermal energy	CO_2	No	There is no fossil fuel consumption in boilers for thermal energy
		CH_4	No	Not applicable
		N_2O	No	Not applicable
	Fossil fuel consumption in cogeneration plant	CO_2	No	There is no fossil fuel consumption in cogeneration plant.
		CH_4	No	Not applicable
		N_2O	No	Not applicable
	Baseline emissions from generation of steam used in the flaring process, if any	CO_2	No	There is no steam used in the flaring process.
		CH_4	No	Not applicable
		N_2O	No	Not applicable
Project Activity	Supplemental fossil fuel consumption at project plant	CO_2	No	There is no supplemental fossil fuel consumption at the project plant.
		CH_4	No	Not applicable
		N_2O	No	Not applicable
	Supplemental electricity consumption.	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
	Electricity import to replace	CO_2	No	Not applicable
		CH_4	No	Not applicable

	Source	Gas	Included?	Justification/Explanation
	captive electricity, which was generated using waste gas in absence of project activity	N_2O	No	Not applicable
	Project emissions from cleaning of gas	CO_2	No	Cleaning of gas is not required in this case
		CH_4	No	Not applicable
		N_2O	No	Not applicable

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

According to ACM0012 version 03.2, the baseline scenario is identified as the most plausible baseline scenario among all realistic and credible alternative(s).

Realistic and credible alternatives should be determined for:

· Waste energy use in the absence of the project activity; and

· Power generation in the absence of the project activity; and

· Steam/heat generation in the absence of the project activity

· Mechanical energy generation in the absence of the project activity

In determining the baseline scenario, project participants shall identify the realistic and credible alternatives to the project activity that would provide an output equivalent to the combined output of all the sub-systems in the project activity scenario. These alternatives may comprise one system or more than one sub-system(s). Therefore the alternative as, identified for the project activity should provide the same heat, power or mechanical energy output as in the project activity scenario and should include the alternate use of the waste energy utilized in the project activity. These alternatives shall be determined as realistic combinations of the following options available for meeting the ‘heat requirement' and/or ‘power requirement’ and/or ‘mechanical energy requirement’ and for ensuring ‘alternate use of waste energy’ as described below:

The project participant shall exclude baseline options that:

- Do not comply with legal and regulatory requirements; or
- Depend on fuels (used for generation of heat, power or mechanical energy), that are not available at the project site.

Step 1: Define the most plausible baseline scenario for the generation of heat and electricity using the following baseline options and combinations.

The proposed project activity will generate electricity only, so according to the methodology, the baseline should be only generation of electricity.

According to ACM0012 version 03.2, for the use of waste energy, the realistic and credible alternative(s) may include:

W1: WECM is directly vented to atmosphere without incineration or waste heat is released to the atmosphere;

W2: WECM is released to the atmosphere (for example after incineration) or waste heat is released to the atmosphere;

W3: Waste energy is sold as an energy source;

W4: Waste energy is used for meeting energy demand;

W5: A portion of the waste gas produced at the facility is captured and used for captive electricity generation, while the rest of the waste gas produced at the facility is vented /flared;

W6: All the waste gas produced at the industrial facility is captured and used for export electricity generation.

Specific analysis on the six alternative scenarios in absence of the proposed project activity show as follows:

As to W1 and W2, FFG is vented to the atmosphere after turned into steam; CLZ is released to the atmosphere through cooling water; COG and BFG are flared before implementation of the proposed project; therefore these alternatives are realistic alternatives since it reflects continuing the current situation.

As to W3, according to FSR there is no waste/heat demand in the area, since the industrial and residential area of populations concentrated are quite far from the facility and hence W3 is not a viable option of possible baseline scenarios.

As to W4, there is no legal or regulatory requirement for using those waste gas or heat for export electricity generation; therefore the alternative is feasible (as same to W6).

As to W5, according to the instruction from the governmental electricity regulatory division, as stated in P7, it is not permitted to construct captive electrical power plants without connecting to the local grid in China; therefore W5 is not a possible alternative.

As to W6, as stated in W4, there is no legal and regulatory requirements constraint that the waste gas produced at the facility is to be used for export electricity generation. Thus it is a plausible baseline scenario.

Based on the above analysis, it is concluded that, for the use of waste heat in the proposed project activity, W1 and W2 "waste heat is released to the atmosphere" and W4 and W6 "Waste energy is used for meeting electricity energy demand" and "All the waste gas produced at the industrial facility is captured and used for export electricity generation." are the possible baseline scenarios.

According to ACM0012 version 03.2, for power generation, the realistic and credible alternative(s) may include:

P1: Proposed project activity not undertaken as a CDM project activity;

P2: On-site or off-site existing/new fossil fuel fired cogeneration plant;

P3: On-site or off-site existing/new renewable energy based cogeneration plant;

P4: On-site or off-site existing/new fossil fuel based existing captive or identified plant;

P5: On-site or off-site existing/new renewable energy or other waste energy based existing captive or identified plant;

P6: Sourced Grid-connected power plants;

P7: Captive Electricity generation from waste energy (if project activity is captive generation with waste energy, this scenario represents captive generation with lower efficiency than the project activity.);

P8: Cogeneration from waste energy (if project activity is cogeneration with waste energy, this scenario represents cogeneration with lower efficiency than the project activity);

P9: Existing power generating equipment (used previous to implementation of project activity for captive electricity generation from a captured portion of waste gas) is either decommissioned to build new more efficient and larger capacity plant or modified or expanded (by installing new equipment), and resulting in higher efficiency, to produce and only export electricity generated from waste gas. The electricity generated by existing equipment for captive consumption is now imported from the grid;

P10: Existing power generating equipment (used previous to implementation of project activity for captive electricity generation from a captured portion of waste gas) is either decommissioned to build new more efficient and larger capacity plant or modified or expanded (by installing new equipment), and resulting in higher efficiency, to produce electricity from waste gas (already utilized portion plus the portion flared/vented) for own consumption and for export;

P11: Existing power generating equipment is maintained and additional electricity generated by grid connected power plants.

Specific analysis on the eleven alternative scenarios in absence of the proposed project activity show:

As to P1, this alternative is in compliance with all applicable legal and regulatory requirements. Therefore, the P1 is possible baseline scenario.

As to P2, there is no fossil fuel based cogeneration plant, moreover there would not be construct that kind of plant since there is not so much demand around the project site; therefore P2 is not realistic.

As to P3, there is no renewable energy based cogeneration plant, moreover there would not be construct that kind of plant since there is not so much demand as stated above around the project site; therefore P3 is not realistic.

As to P4, there is no fossil fuelled captive electricity generating facility in or around the project site. It is prohibited to construct an electricity generating facility with capacity under 135MW, especially under 100MW for fossil fuelled among the covering area of relatively bigger grid like NWPG in China. According to the proposed project, the capacity of the generator is only 20MW thus it is impossible to construct the comparable capacity of fossil fuelled electricity generating facility in China; therefore P4 is not realistic.

As to P5, there is no renewable energy based captive electricity generating facility in or around the project site. Moreover, as the same reason to P4, P5 is not realistic.

As to P6, the project site is located in the covering area of NWPG; many of the grid-connected electricity generating facilities are dominated with coal. It is very natural to be generated the comparable amount of electricity with those facilities; therefore P6 is realistic.

As to P7, according to the instruction from the governmental electricity regulatory division, it is not permitted to consume the electricity directly by the owner itself, and has to sold the gross amount of electricity to the grid firstly since the difference of the unit prices of sale and purchase; therefore P7 is not feasible.

As to P8, there is no cogeneration system fuelled by waste energy in and around the project site. Following the reason stated in W3, there would be no need to the system in the future, thus it would not be constructed; therefore P8 is not feasible.

As to P9, there is no existing electricity generating facility in the project site; therefore P9 is not applicable option.

As to P10, there is no existing electricity generating facility in the project site; therefore P10 is not applicable option.

As to P11, there is no existing electricity generating facility in the project site; therefore P11 is not applicable option.

Based on the above analysis, the possible baseline scenarios for the power generation are P1 "Proposed project activity not undertaken as a CDM project activity" and P6 "Sourced Grid-connected power plants"

Step 2: Identify the fuel for the baseline choice of energy source taking into account the national and/or sectional policies as applicable.

The identified baseline scenario is grid-connected power plants, which uses a combination of fossil fuels, for example coal, gas, oil, and so on. The fuel of power plants which connected NWGP, refer to the annex 3 of this PDD.

Step 3: step 2 and/or step 3 of the latest approved version of the "Tool for the demonstration and assessment of additionally" shall be used to identify the most plausible baseline scenarios by eliminating non-feasible options (e.g. alternatives where barriers are prohibitive or which are clearly economically unattractive).

As derived in Step1, there are two alternative scenarios remained.

	P1	P6
W1&W2	W1&W2 and P1 would not be occurred coincidently.	The electricity is supplied by sourced Grid-connected power plants and the waste energy is released to the atmosphere; i.e., this case does match.
W4&W6	Waste energy produced at the industrial facility is captured and used for export electricity generation and this case does match. .	The waste energy is utilised only for generating electricity; therefore W4&W6 and P6 would not be occurred coincidently.

scenario	Baseline options		description
	waste energy use	Power generation	
1	W1 and W2	P6	The electricity is supplied by sourced Grid-connected power plants and the waste heat is released to the atmosphere.
2	W4 and W6	P1	Waste energy produced at the industrial facility is captured and used for export electricity generation without CDM scheme.

STEP 4: If more than one credible and plausible alternative scenario remain, the alternative with the lowest baseline emissions shall be considered as the most likely baseline scenario.

There are 2 alternative scenarios remain; therefore it is required more discussion below:

- [W1&W2/P6]
  The waste energy recovered with the proposed project is not utilised, and the comparable amount of electricity is generated with other the grid connected electricity generating facilities. This alternative scenario represents the continuation of the current situation; therefore this scenario is feasible.
- [W4&W6/P1]

This alternative scenario represents applying the project scheme without CDM. As stated B.5 (*Investment Analysis*), the scheme cannot be carried out from economical barrier; therefore this scenario is not feasible.

Based on the above analysis, the baseline scenario matrix of the proposed project activity is:

scenario	Baseline options		description
	waste energy use	Power generation	
1	W1 and W2	P6	The electricity is supplied by sourced Grid-connected power plants and the waste energy is released to the atmosphere.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

The timeline of important events in the project can be described as follows and this shows that CDM was considered as an integral part of this project right from the outset.

Table B.3 Time schedule of the proposed project

Date	Events and Comments	Remark
April, 2009	Feasibility Study Report (FSR) report date	
May, 2009	EIA report	
31,May, 2009	EIA approval	
1, July, 2009	FSR approval	
15, July, 2009	The meeting of board discussed the draft of FSR which had not financial attractive, and decided to develop CDM project.	The date when CDM was initially considered.
Sep, 2009	The project owner signed the commissioned agreement of developing CDM project with Shanxi Industrial Technology Research Institute to develop the project as CDM project.	The date when CDM applying was started
6, Jan, 2010	Purchasing the Main Equipment	Project start date
Mar, 2010	Stakeholder’s comment	
May, 2010	Notification to NDRC	
June, 2010	Notification to UNFCCC	
Sep, 2010	The buyer checked onsite.	Japan Tepia
Jan, 2011	Site visit by JCI	
2011	ERPA contact signed	
2011	Chinese Letter of Approval issued	

From the table above, we can conclude that CDM has been seriously taken into account before the construction of the proposed project activity.

According to ACM0012, the “Tool for the demonstration and assessment of additionality (version 05.2)”is applied to demonstrate the additionality of the project activity versus the baseline scenario. The processes are as follows:

Step 1: identification of alternatives to the project activity consistent with current laws and regulations

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

As stated B.4, the below 2 alternative scenarios are supposed:

scenario	Baseline options		description
	waste energy use	Power generation	
1	W1 and W2	P6	The electricity is supplied by sourced Grid-connected power plants and the waste heat is released to the atmosphere.
2	W4 and W6	P1	Waste energy produced at the industrial facility is captured and used for export electricity generation.

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

Based on the analysis, alternative options W1&W2/P6 and W4&W6/P1 are remaining and they all comply with Chinese legal and regulatory requirement.

However alternative option W4&W6/P1 is not the only alternative of the project activity and the following steps will show that the proposed project in the absence of CDM is not economically feasible (step 2) and also faces some barriers (step 3).

Step 2: Investment analysis

The purpose of investment analysis is to determine whether the proposed project activity is financially less attractive than other alternatives without the revenue from the sales of CERs. The investment analysis was done in the following steps:

Sub-step 2a: Determine appropriate analysis method:

The “Tool for the Demonstration an Assessment of Additionality” recommends three investment analysis methods including simple cost analysis (option I), investment comparison analysis (option II) and benchmark analysis (option III).

The proposed project generates financial and economic benefits through the sales of electricity, therefore option I “simple cost analysis” is not appropriate. The alternative scenario 1 of the project activity is not of an investment project; therefore option II “investment comparison analysis” is not appropriate. For the proposed project The full investment internal rate of returns (FIRR) is available; therefore the project will use the option III benchmark analysis.

Sub- step 2b: Option 3-Apply benchmark analysis:

With reference to the *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*, the financial benchmark rate of return (after tax) of China’s power industries is 8% for the FIRR of total investment. Presently[2], the financial benchmark rate of return is used in the analysis of waste heat recovery for power projects in China. On the basis of above benchmark, calculation and comparison of financial indicators are carried out in sub-step 2c.

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

Table B.4 basic parameters of investment analysis of the project[3]

Items	Unit	Value	Reference
Capacity	MW	20	Feasibility study report
Fixed assets Investment	10000Yuan	20,009.83	Feasibility study report

[2] State Power Corporation of China, Interim Rules On Economic Assessment of Electrical Engineering Retrofit Project. Beijing: China Electric Power Press, 2003.

[3] Source from *Feasibility study report*

Items	Unit	Value	Reference
Average Annual Depreciation Fee	10000Yuan	1,102.54	Feasibility study report
Average O&M costs	10000Yuan	1582.08	Feasibility study report
Net power supply	GWh/year	13.539	Feasibility study report
Electricity Tariff (including VAT)	Yuan/kWh	0.315[4]	Feasibility study report
Electricity Tariff (excluding VAT)	Yuan/kWh	0.269	Feasibility study report
Income tax	%	25	Feasibility study report
Residues rate	%	5	Feasibility study report
Project lifetime	Year	15	Feasibility study report
CER price	EUR	10	Project Owner

The input value of parameters used in the investment analysis is taken from the *Feasibility Study Report (FSR)* finished by *Hebei Energy Engineering Design Co., Ltd.* in April 2009 and approved by *Shaanxi Development and Reform Commission on 1 July 2009.*

Calculated on the basis of the above parameters of investment, the IRR of the proposed project activity is 5.28%, lower than the benchmark financial indicator 8% of China' s power industry. And with the support of CDM revenues, the IRR of the proposed project activity would reach 11.23%, which is higher than benchmark 8%. Hence the proposed project is less economically attractive to the project owner if no CDM revenues.

Table B.5. Comparison of financial indicators with and without CER revenues

Item	IRR	Benchmark
Without income from CERs	5.28%	8%
With income from CERs	11.23%	8%

Sub-step 2d. Sensitivity analysis.

The objective of this sub-step is to show the conclusion regarding the above financial attractiveness is rebut to reasonable variations of the critical assumptions. The result of the investment analysis supports the proposed project is not financially attractive.

Four impact factors are considered in the following sensitivity analysis:

1) Total fixed assets investment.

2) Operation and Maintenance Cost.

3) Tariff.

4) Electricity Export.

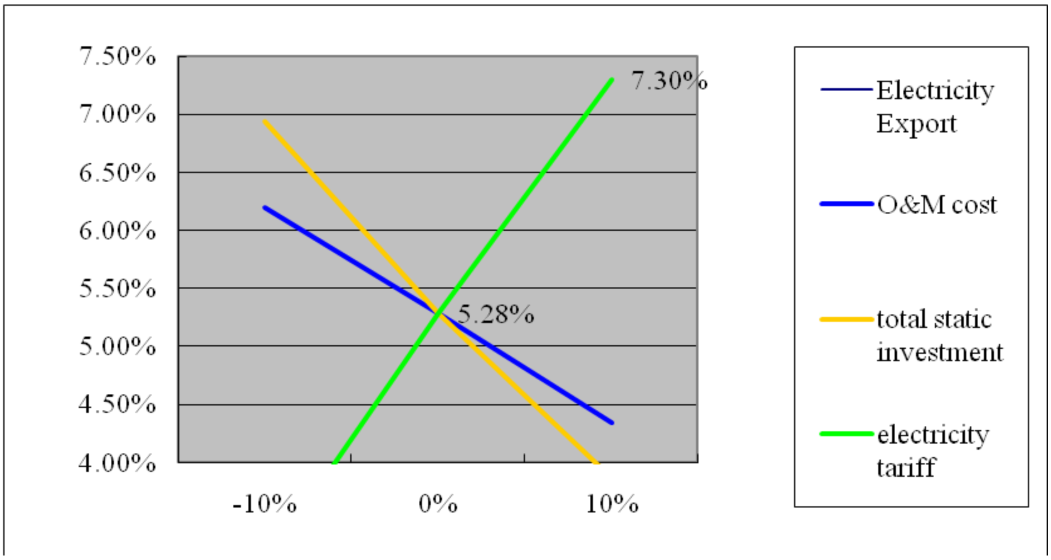
According to "Guidance on the Assessment of Investment Analysis"[5], assuming the above factors vary in the range of -10%~+10%, the project IRR (without CDM) varies to different extents with the variation of these four factors, as shown below.

[4] http://www.spic.gov.cn/admin/pub_journalshow.asp?id=103849&chid=100068

[5] http://cdm.unfccc.int/EB/041/eb41_repan45.pdf

Table B.6 sensitivity analysis of the project

	-10%	0%	10%
Electricity Export	3.12%	5.28%	7.30%
O&M cost	6.19%	5.28%	4.35%
total static investment	6.94%	5.28%	3.87%
electricity tariff	3.12%	5.28%	7.30%



According to the above sensitive analysis, the project IRR would NOT reach the benchmark 8% whenever any of the net power supplies, electricity tariff, O&M cost or the fixed assets investment by 10%.

The above analysis shows that without further incentive, in this case from the CDM, the project activity is less financial attractive and owner would not invest in the proposed project activity, and alternative scenario 1 is excluded.

Therefore, the sensitivity analysis strengthens the conclusion that the proposed project is financially unattractive.

Step 3. Barrier analysis.

This step is not used.

Step 4. Common Practice Analysis

Sub-step 4a. Analysis other activity similar to the proposed project

According to the "Tool for the Demonstration and Assessment of Additionally", projects are considered "similar" in case they are located in the "same county/region", are of "similar scale", and "take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc".

The proposed project involved the utilisation of waste blast furnace gas (BFG), waste coke oven gas (COG) , cooling of Lead and Zinc smelting (CLZ), waste fuming furnace gas(FFG) to generate electricity to sell the electricity to the North West Power Grid (NWPG). There are no other similar cases which recover same four waste heats in China.

According to the *tool*, the similar projects to the proposed project are defined as the electricity generating project in Shaanxi province (which is geographically and regularly same with the proposed project), belonging to the same industrial sector. The project owner producing not only lead and zinc but also cokes; therefore the industrial sector can be determined as lead and zinc smelting and cokes producing industry.

Table B.7 the project activities similar to the proposed project activity

No.	Project Name	Waste Energy	Waste gas usage
1	Shaanxi Xinglong Cogeneration Co., Ltd.	COG(Waste gas from Shaanxi Long-men Iron & Steel Co. Ltd)	Generating electricity apply for CDM with capacity 25MW
2	Shaanxi Haiyan Coke Making Group	COG(The capacity of the coke line is 1,000,000 tonne)	Generating electricity apply for CDM with capacity 24MW.
3	Hancheng Rongchang Coke Making Co., Ltd	COG(The capacity of the coke line is 150,000 tonne)	Emission into atmosphere after ignition
4	Hancheng Rongchang Coke Making Co., Ltd.	COG(The capacity of the coke line is 150,000 tonne)	Emission into atmosphere after ignition
5	Hancheng Heli Coke Making Co., Ltd	COG(The capacity of the coke line is 100,000 tonne)	Emission into atmosphere after ignition
6	Shaanxi Coke Making Co., Ltd.	COG(The capacity of the coke line is 700,000 tonne)	Generating electricity without CDM, capacity 3MW.
7	Shaanxi Shangluo Smelting Plant	Recovery of Steam cooling system and waste heat boiler	Generating electricity with capacity 4MW.
8	Shaanxi Hanzhong Bayi Zinc Industry Co., Ltd.	Recovery of Steam cooling system and waste heat boiler	Generating electricity with capacity 3MW.
9	Shaanxi Dongling Zinc Industry C o., Ltd.	Recovery of Steam cooling system and waste heat boiler	Generating electricity apply for CDM with capacity 13MW.

Sub-step 4b. Discuss any similar options that are occurring

As stated in the table B.7 the project activity similar to the proposed project activity in Shaanxi Province are shown.

Project No.1 had been registered at 2008, and project No.2 is applying CDM, so they should be excluded in this analysis.

Project No.6 is a quite special case and more detailed discussion is given here. It’s a captive power plant with an installed capacity of 3 MW, which is much lower than 20MW. The main task is to provide service for the project’s construction and operation is not from financial and economic angle. Shaanxi Coke Making Co., Ltd. is a state-owned enterprise, so it can get the favourable policies and financial support from the government[6]. So, it should be excluded in this analysis.

[6] http://www.sxcoking.com/Column-eyes/windows/infomationlist.jsp0003subcate_id=5584.html

The projects No.3-5 are observed, but there are essential distinctions between the proposed project activity and then, therefore, it concluded that the proposed project is not common practice.

Project No.7-9 are all Zinc Smelting Plant, and they all recover their waste heat for electricity generation. The capacities of project No. 7 and 8 are low, which are all lower than 10MW, less than50% of the proposed project capacity, and project No.9 is applying CDM. These four projects are all recover waste heat for power generation. They should not be included in this analysis.

As described above, the above analysis provides proofs for additionality of the proposed project. In conclusion, the project is additionality.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline Emissions

The baseline emissions for the year y shall be determined as per the methodology ACM0012 version 03.2;

$BE_y = BE_{En,y} + BE_{fist,y}$

Where;

BE_y Total baseline emission during the year *y* in tons of CO_2

$BE_{En,y}$ Baseline emission from energy generated by project activity during the year *y* in tons of CO_2

$BE_{fist,y}$ Baseline emissions from generation of steam, if any using fossil fuel, that would have been used for flaring the waste gas in absence of the project activity (tCO_2e per year), calculated as per equation (1c). This is relevant for those project activities where in the baseline steam is used to flare the waste gas.

In this case, $BE_{fist,y}$ is zero since there is no baseline steam used to flare the waste gas.

The calculation of baseline emission ($BE_{En,y}$) depends on the identified baseline scenario. Here the Baseline Scenario has been identified as Scenario 1 as per the methodology ACM0012/Version03.2.

Baseline emissions for Scenario 1

$BE_{EN,y} = BE_{Elec,y} + BE_{Ther,y}$

Where;

$BE_{Elec,y}$ Baseline emission from electricity during the year *y* in tons of CO_2

$BE_{Ther,y}$ Baseline emissions from thermal energy (due to heat generation by element process) during the year *y* in tons of tCO_2.

(a.i) Baseline emissions from electricity ($BE_{electircity,y}$) Type-1 activities:

$$BE_{Elec,y} = f_{cap} * f_{wcm} * \sum_j \sum_i (EG_{i,j,y} * EF_{Elec,i,j,y}) \quad (1a\text{-}1)$$

Where;

$BE_{Elec,y}$ Baseline emission due to displacement of electricity during the year y in tons of CO_2.

$EG_{i,j,y}$	The quantity of electricity supplied to the recipient j by generator, which in the absence of the project activity would have been sourced from ith source (i can be either grid or identified source) during the year y in MWh
$EF_{Elec,i,j,y}$	The CO_2 emission factor for the electricity source I (i=gr(grid) or i=is (identified source)), displaced due to the project activity, during the year y in tons CO_2/MWh
f_{wcm}	Fraction of total electricity generated by the project activity using waste energy. This fraction is 1 if the electricity generation is purely from use of waste energy. If the boiler providing steam for electricity generation use of waste and fossil fuels, this factor is estimated using equation (1d). If the steam used for generation of the electricity is produced in dedicated boilers but supplied through common header, this factor is estimated using equation (1d/1e). NOTE: For project activity using waste energy to generate electricity, electricity generated from waste pressure use should be measurable and this fraction is 1.
f_{cap}	Energy that would have been produced in project year *y* using waste energy generated in base year expressed as a fraction of total energy produced using waste source in year *y*. The ratio is 1 if the waste energy generated in project year *y* is same or less than generated in base year. The value is estimated using equation (1f), or if-1) or (if-2), or (ig) or (1g-1) or (1h).

As for the proposed project, $BE_{Ther,y}$ is zero and hence

$BE_{EN,y}=BE_{Elec,y}$

The methodology points out that if the displaced electricity for recipient is supplied by a connected grid system, the CO_2 emission factor of the electricity $EF_{elec,gr,j,y}$ shall be determined following the guidance provided in the “Tool to calculate the emission factor for an electricity system”.

As stated in the section B.4, the most reliable baseline alternative is “Sourced from the grid-connected plants”; the emission factor of the substituted electricity should be calculated according to “Tool to calculate the emission factor for an electricity system”.

(1) Calculation of $EF_{grid,CM,y}$ (EF_y)

In accordance with the calculating steps and formulas provided in “Tool to calculate the emission factor for an electricity system” (version 02), the emission reductions of the project activity are calculated as follows steps:

Step 1: Identify the relevant electricity systems

According to the announcement of Grid Boundary by DNA of China, North West China Grid covers five provinces (Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang), the project activity is located in Shaanxi and it is appropriate to select the North West China Power Grid as project system boundary.

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

It can be chose between the following two options to calculate the operating margin and build margin emission factor:

Option 1: only grid power plants are included in the calculation.

Option 2: both grid power plants and off-grid power plants are included in the calculation.

In china, off-grid power plants generation is not significant. So, project participant choose Option 1: Only grid power plant are included in the calculating to calculate the operating margin and build margin emission factor:

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

Calculation of OM emission factor should be based on one of the following four methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch Data Analysis OM, or

(d) Average OM. For method (b): This method needs the annual load duration curve of the grid. As the detailed hourly load data in China are not publicly available, it is unfeasible to apply this method. If the dispatch data is available, method (c) should be the first choice. This method requires the dispatch order of each power plant and the dispatched electricity generation of all power plants in the power grid during every operation hour period. Since the dispatch data, power plants operation data are considered as confidential materials and only for internal usage not available publicly. Thus, method (c) is not applicable for the proposed project activity.

The Simple OM method (a) can only be used where low-cost/must run resources constitute7 less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term normal for hydroelectricity production. Low operating cost and must run resources typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants. From 2003-2007, the low cost must run resources constitute less than 50% of total amount grid generation output. Therefore, method (a) is applicable for the project.

Average OM (d) is not applicable. For the most recent 5 years (2003-2007) of NWPG, the low-cost/must run resources constitute less than 50% of total generation of NWPG as follow table 6.1[8], The average is much less than 50%.

Table 6.1 The Proportion of Low-cost/Must Run Resources in NWPG

Year	2003	2004	2005	2006	2007
Total Power Generation(GWh)	115,625	142,612	184,562	213,100	244,000
Total Low-cost/must run resources(Hydro)	22,330	31,145	42,801	48,000	53,300
Total Low-cost/must run resources(Others)	34	484	785.2	1,130	1,420
The Proportion of Low-cost/Must run resources in NWPG(%)	19.34	22.46	23.62	23.05	22.43

As a result, the simple OM method is the only reasonable and feasible method among the four methods for calculating the Operating Margin emission factor ($EF_{OM,y}$) of the West North China Power Grid.

Step 4: Calculate the operating margin emission factor ($EF_{grid,OM,y}$) according to the selected method

<u>(a) Simple OM</u>

[7] Low operating cost and must run resources typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants. For China, due to the relative data is not available, the share excluding the fossil electricity (coal, oil and natural gas) are assumed as Low operating cost and must run resources is conservative, which is named “others” in annex 3.

[8] China Electric Power Yearbook 2005-2009

According to the "Tool to calculate the emission factor for an electricity system" (version 2), the simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

- Based on data on fuel consumption and net electricity generation of each power plant / unit (Option A), or
- Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B), or
- Based on data 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 C)

As stated in the Tool, Option A should be preferred and must be used if fuel consumption data is available for each power plant/unit. In other cases, option B or C can be used. For the purpose of calculating the simple OM, option C should be used if necessary data for option A and option B is not available and can only be used if nuclear and renewable power generation is considered as low-cost/must run power sources and data of the quantity of electricity supplied to the grid by these sources are available.

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

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \tag{4a}$$

Where;

$EF_{grid,OMsimple,y}$	Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$FC_{i,y}$	Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,i,y}$	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
EG_y	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)
i	All fossil fuel types combusted in power sources in the project electricity system in year y
y	Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

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

In the project activity, the data of net calorific values of the fuels is from the China Energy Statistical Yearbook and the data of emission factors of the fuels are from IPCC 2006 default.

The simple OM emission factor of the proposed project is calculated based on the electricity generation mix of the West North Power Grid, excluding low operating cost/must run power plant, such as wind power, hydropower etc. The data on installed capacity and electricity output of different power generation technology options are from the China Electric Power Yearbook (2003~2007, published annually). The data on different fuel consumptions for power generation in the West North Power Grid are from the Energy Balance Table of Shaanxi, Qinghai, Gansu, Xinjiang, Ningxia in year 2002- 2006 from the China Energy Statistical Yearbook (2003-2007 Edition). Therefore, the Simple OM Emission Factor of proposed project is an ex-ante emission factor, based on 3-year average of the most recent statistics available at the time that the PDD was developed.

The adding part of electricity power into the West North Grid mostly comes from the West North Power Grid and the quantity of electricity exported to the West North Grid is keeping increasing in the recent three years, hence this part of electricity has been taken into account. The Chinese DNA published the latest $EF_{OM,y}$ of NWPG will of be adopted in this PDD and its value is 1.0246 (tCO_2/MWh) and the detail calculation is shown as Annex 3.

The data used were the most recent available data published by the China DNA at the time of start of validation and PDD GSP.

Step 5: Identify the group of power units to be included in the build margin (BM)

The sample group of power units *m* used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or

(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently

The PDD identifies option (b) for sample group of power units, as the information for five power units that have been built most recently is not available in China. The direct application of the approach is difficult IN China. The EB has provided guidance on this matter with respect to the application of the AMS-I.D and AM0005 methodologies for project in China on 7 October 2005 in response to a request for the deviation by DNV on this matter. The EB accepted the use of capacity additions to identify the share of thermal power plants in additions to the grid instead of using power generation. The relevance of this EB guidance is also applicable to the “Tool to calculate the emission factor for an electricity system”. The calculation details are described in step 5 below.

As for vintage of data, Option 1 is selected.

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

As the crediting period for the proposed project is fixed 10 years, the build margin emission factor ex-ante will the only BM emission factor calculated for the proposed project.

Step 6: Calculate the build margin emission factor ($EF_{grid,BM,y}$)

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

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \quad (4b)$$

Where;

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

Because some data are not available, the BM calculation in this PDD adopts the deviation method (Application of AM0005 and AMS-I.D in China requested by DNV) agreed by the CDM EB9.

Firstly, calculate the new installed capacity and its power generation technology mix. Secondly, calculate the weights of new capacity in each generation technology. And finally, calculate the BM emission factor at the commercialized best efficiency performance of each generation technology.

Because the installed capacity of the coal-fired, oil-fired and gas-fired technology cannot be extracted directly from the existing statistical data, the BM calculation in this PDD adopts the following method: First, use the available data in the energy balance sheets on the most recent year to calculate the share of CO_2 emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO_2 emissions. Second, use the proportions as the weights, based on the emission factors at the commercialized best efficiency performance of each generation technology, calculate the emission factor of the thermal power in grid. Thirdly, this thermal emission factor is multiplied by the proportion of thermal power in the new 20% capacity. Finally the BM emission factor is got.

The detail calculation steps are as follows:

Sub-step 6a: Calculation of the share of CO_2 emissions from solid, liquid and gaseous fuels.

$$\lambda_{COAL,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}} \quad (4c)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}} \quad (4d)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}} \quad (4e)$$

Where:

$F_{i,j,y}$	The amount of fuel i consumed by province j in year(s) *y*
$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel type i in year *y* (GJ / mass or volume unit)
$EF_{CO2,i,y}$	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
	Coal, Oil and Gas refer to the solid, liquid and gaseous fuel.

[9] http://cdm.unfccc.int/Projects/Deviations/index.html

Sub-step 6b: Calculation the emission factor of thermal power.

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (4f)$$

$EF_{Coal,Adv}$、$EF_{Oil,Adv}$、$E_{FGas,Adv}$ represent the emission factors of the best efficient and commercial coal-fired, oil-fuel and gas-fuel generation technologies.

Sub-step 6c: Calculation BM in the grid.

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (4g)$$

Where:

CAP_{Total}	The total added installed capacity;
$CAP_{Thermal\ l}$	The total added installed capacity for thermal power.

Same as the OM, The Chinese DNA published the latest $EF_{BM,y}$ of NWPG, and it will be adopted in this PDD and the detail calculation is shown as Annex 3.

Step 7. Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (4h)$$

Where:

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

The following default values should be used for w_{OM} and w_{BM}:

- Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatch able nature) for the first crediting period and for subsequent crediting periods.
- All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

Therefore, for the proposed project w_{OM} = 0.5 and w_{BM} = 0.5 is chosen. Then CO_2 emission factor for NWPG EF_y is **0.8340**(tCO_2/MWh).

(2) Determination of *EGy*

According to the scenario identified for this proposed project as showed before, EG_y corresponds to the net quantity of electricity generation in the project plant ($EG_y = EG_{PJ,y}$), which is the same amount as the power fed into the grid by the proposed project activity. The plant own consumption and electricity imported from grid are already taken into the calculation of this parameter.

Calculation of the energy generated (electricity and/or steam) in units supplied by WECM and other fuels

Situation-1: The procedure specified below, should be applied when the direct measurement of the energy generated using the WECM is not possible as other fossil fuel(s) along with WECM are used for energy generation. The relative share of the total generation from WECM is calculated by considering the total electricity produced, the amount and calorific values of the other fuels and of the WECM used, and average efficiency of the plants where the energy is produced. It is not applicable here.

Situation-2: An alternative method that could be used when it is not possible to measure the net calorific value of the waste gas/heat, and steam generated with different fuels in dedicated boilers are fed to turbine/s through common steam header takes into account that the relative share of the total generation from WECM is calculated by considering the total steam produced and the amount of steam generated from each boiler. The fraction of energy of energy produced by the WECM in project activity is calculated as follows:

$$f_{wcm} = \frac{ST_{whr,y}}{ST_{whr,y} + ST_{other,y}} \qquad (5)$$

Where:

$ST_{whr,y}$ Energy content of the steam generated in waste heat recovery boiler fed to turbine via common steam header.

$ST_{other,y}$ Energy content of steam generated in other boilers fed to turbine via common steam header

The proposed project activity utilizes the waste heat for power generation and no other fuels will be used. All the waste heat is to be used in the project activity, so f_{wcm} equal 1.

Capping of baseline emissions

During the development of the PDD, PP was confused to the f_{wcm} calculation part of ACM0012 V03.2. Methodology ACM0012 V03.2 clearly mentions that Q_{WG} shall be the quantity of waste gas and the appropriate measurement unit shall be Nm3. However Nm3 is very difficult to measure waste heat.

It is found that monitoring of the waste heat is very complex. Firstly, waste heat is a relative value(as opposed to volume of waste gas) and should always be measured relative to a certain temperature, as absolute energy has no relevance in the context of waste heat utilization and can't be monitored directly; Secondly, gases coming from the industry processes are aggressive and would easily damage the instruments; Thirdly, to properly monitor the waste heat, instruments would need to be installed at several points, which would require a substantial additional investment. So there are technical limitations in doing so.

The proposed project activity is a waste energy recovery for power generation project. Hence, the above described difficulties apply for this project activity.

As an introduction of element conservativeness, this methodology requires that baseline emissions should be capped irrespective of planned/unplanned or actual increase in output of plant, change in operational parameters and practices, change in fuel type and quantity resulting in an increase in generation of waste energy. In case of planned expansion a separate CDM project should be registered for additional capacity. The cap can be estimated using the three Methods described below. Project proponents shall use Method-1 to estimate the cap if data is available. In case of project activities implemented in a new facility, or in facilities where three-year data on production is unavailable, Method-2 shall be used. In case the project proponents demonstrate technical limitations in direct monitoring of waste heat/pressure of waste energy carrying medium(WECM), then Method-3 is used.

Method-1: Where the historical data on energy released by the waste energy carrying medium is available, the baseline emissions are capped at the maximum quantity of waste energy released into the atmosphere under normal operation conditions in the three years previous to the project activity.

Method-2: The manufacture's data for the industrial facility shall be used to estimate the amount of waste energy the industrial facility generates per unit of product generated by the process that generates waste energy (either product of departmental process or product of entire plant, whichever is more justifiable and accurate). In case any modification is carried out by the project proponent or in case the manufacturer's data is not available for an assessment, this should be carried out by independent qualified/certified external process experts such as a chartered engineer on a conservative quantity of waste energy generated by plant per unit of product manufactured by the process generating waste energy. The value arrived based on above sources of data, shall be used to estimate the baseline cap (f_{cap}). The documentation of such assessment shall be verified by the validating DOE.

The basis for using the capped value (including manufacturer's design document/letter and the expert's analysis) should be provided to DOE during validation.

Method-3: In some cases, it may not be possible to measure the waste energy (heat, sensible heat, heat of reaction, heat of combustion etc.), enthalpy or pressure content of WECM. Therefore there is no historic data available for these cases. These cases may be of following two types.

Case 1: The energy is recovered from WECM and converted into final output energy through waste heat recovery equipment. For such cases f_{cap} should be the ratio of maximum theoretical energy recoverable using the project activity waste heat recovery equipment and actual energy recovered under the project activity (using direct measurement). For estimating the theoretical recoverable energy, manufacturer' specifications can be used. Alternatively, technical assessment can be conducted by independent qualified/certified external process experts such as chartered engineers.

Case 2: The energy is recovered from WECM in intermediate energy recovery equipment using an intermediate source. For example, an intermediate source to carry energy from primary WECM may include the sources such as water, oil or air to extract waste energy entrapped in chemicals(heat of reaction) or solids(sensible heat). This intermediate energy source is finally used to generate the output energy in the final waste heat recovery equipment. For these cases f_{cap} is the ratio of maximum theoretical intermediate energy recoverable from intermediate waste heat recovery equipment and actual intermediate energy recovered under the project activity (using direct measurement). For estimating the theoretical energy, manufacturer's specifications can be used. Alternatively, technical assessment can be carried out by independent qualified/certified external process experts such as chartered engineers.

For this project, the waste heat generated cannot be directly monitored and the historical data on energy released is not available, so Method-3 is applied and under this method, following equations should be used to estimate f_{cap}

$$f_{cap} = \frac{Q_{OE,BL}}{Q_{OE,y}} \qquad (6)$$

Where:

$Q_{OE,BL}$ Output/intermediate energy (electricity) that can be theoretically produced (in GWh), to be determined on the basis of maximum recoverable energy from the WECM, which would be released (or WECM would have been flared or energy content of WECM would have been wasted) in the absence of CDM project activity.

$Q_{OE,y}$ Quantity of actual output/intermediate energy (electricity) during year y (in GWh)

The proposed project activity recovers the waste energy from the process of coke production and other ways in proposed project that waste heat cannot monitor directly before the heat recovery boilers because no device can be used for monitoring the reaction heat. Furthermore, the independent external expert and Feasibility Study Report assessment are both on the basis of the final output energy, in the form of electricity, at the exit of the generators.

According to the clarification by an independent external expert of the FSR, in theory, the maximum recoverable energy from WECM can generate 147 GWh electricity per year, which will be used as $Q_{OE,BL}$ in the (6) to estimate f_{cap}. During the calculation of emission reductions in the PDD, f_{cap} is calculated to be 1.

Over the 10 year's crediting period, the value of f_{cap} will be updated ex post when the $Q_{OE,y}$ is monitored and its value is available for calculating f_{cap} as per the equation (1h) above.

(3) Calculation of baseline emissions (*BE_y*)

$BE_y = EG_y * EF_y$

Project Emissions

Project Emissions include emission due to combustion of auxiliary fuel to supplement waste gas and electricity emissions due to consumption of electricity for cleaning of gas before used for generation of heat/energy/electricity.

$$PF_y = PE_{AF,y} + PE_{EL,y} + PE_{EL,\mathrm{Im}\,port,y}$$

Where:

PF_y Project emissions due to project activity.

$PE_{AF,y}$ Project activity emissions from on-side consumption of fossil fuels by the cogeneration plant(s), in case they are used as supplementary fuels, due to non-availability of waste gas to the project activity or due to any other reason.

$PE_{EL,y}$ Project activity emissions from on-side consumption of electricity for gas cleaning equipment or other equipments in the system.

$PE_{EL,\mathrm{Im}\,port,y}$ Project activity emissions from import of electricity replacing captive electricity generated in the absence of the project activity for Type-2 project activities

Note: In case where the electricity was consumed in gas cleaning equipment in the baseline as well, project emissions due to electricity consumption for gas cleaning can be ignored.

As a Type-1 project, the $PE_{EL,\mathrm{Im}\,port,y}$ is zero, so,

$$PF_y = PE_{AF,y} + PE_{EL,y}$$

(1)Project emission due to auxiliary fossil fuel

There emissions are calculated by multiplying the quantity of fossil fuels ($FF_{i,y}$) used by the recipient plant(s) with the CO_2 emission factor of the fuel type I ($EFCO_2$, i), as follows:

$$PE_{AF,y} = \sum FF_{i,y} \cdot NCV_i \cdot EF_{CO2,i}$$

Where:

$PE_{AF,y}$ Are the emissions from the project activity in year *y* in due to combustion of auxiliary fuel in tonnes of CO_2

$FF_{i,y}$ Is the quantity of fossil fuel type *i* combusted to supplement waste gas in the project activity during the year *y*, in energy or mass units

NCV_i Is the net calorific value of the fossil fuel type *i* combusted as supplementary fuel, in TJ per unit of energy or mass units, obtained from reliable local or national data, if available, otherwise taken from the country specific IPCC default factors.

$EF_{CO2,i}$ Is the CO_2 emission factor per unit of energy or mass of the fuel type *i* in tons CO_2 obtained from reliable local or national data, if available, otherwise taken from the country specific IPCC default factors

As no auxiliary fuel is consumed due to the project activity, and $PE_{AF,y}$ =0

(2)Project emissions due to electricity consumption of gas cleaning equipment or other equipment in the system

Project emissions are calculated by multiplying the CO_2 emission factor for electricity ($EF_{CO2,EL}$) by the total amount of electricity used as a result of the project activity ($EC_{PJ,y}$). The source of electricity may be the grid or a captive power plant.

$$PE_{EL,y} = EC_{Pj,y} \times EF_{CO2,EL,y}$$

Where:

$PE_{EL,y}$ Project emissions from consumption of electricity in gas cleaning equipment of project activity (t CO_2/yr)

$EC_{Pj,y}$ Additional electricity consumed in year *y* as a result of the implementation of the project activity (MWh)

$EF_{CO2,EL,y}$ CO_2 emission factor for electricity consumed by the project activity in year *y* (TCO_2/MWh)

The proposed project activity is to use waste heat to generate steam for electricity generation, and there is no gas cleaning equipment in the project boundary. So in this section, electricity consumption for gas clean as a result of the project activity $PE_{EL,y}$ is considered to be zero and thus PEy is zero.

Leakage

No leakage is applicable under this methodology.

Emission Reductions

Emission reductions due to the project activity during the year *y* are calculated as follow:

$$ER_y = BE_y - PE_y$$

Where:

ER_y The total emissions reductions during the year *y* in tons of CO_2

BE_y The baseline emissions for the project activity during the year *y* in tons of CO_2, applicable to Scenario 2

PE_y The emissions from the project activity during the year *y* in tons of CO_2

According to the description above, we achieve that,

$$BE_y = EG_y \times EF_y$$

Where:

EG_y Is the net quantity of electricity supplied to the North China Grid during the year *y* in MWh.

The estimated baseline emissions are based on power supply and ex ante calculation of the emission factor, and will hence be revised during the implementation of the project activity on the basis of actual power supply to the grid. The emission factor, however, is left unchanged during these calculations of actual emission reductions.

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	$Q_{OE,BL}$
Data unit:	GWh
Description:	Quantity of electricity generated that can be theoretically produced by the project activity, to be determined on the basis of maximum recoverable energy from the WECM, which would have been released (or WECM would have been flared or energy content of WECM would have been wasted) in the absence of CDM project activity.
Source of data used:	Use Method-3 for Calculation. The data source is provided by the manufacturer's specifications or external export.
Value applied:	147
Justification of the choice of data or description of measurement methods and procedures actually applied :	For industrial facility, it is determined by the method as follow: Estimated based on information provided by the technology supplier and the external expert on the waste/heat/pressure generation per unit of product and volume or quantity of production.(Please refer equation)
Any comment:	In this case, waste heat is used for power generation and industrial facility which generates waste heat is newly installed, hence Method 3 is used.

Data / Parameter:	$F_{i,j,y}$
Data unit:	t/m^3
Description:	Total amount of fuel i(in a mass or volume unit) consumed by all the relevant power source j in year of *y*
Source of data used:	China Energy Statistic Yearbook
Value applied:	Please refer to annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The detailed data of fuels consumed by power plants are not available publicly, so the aggregated data by fuel types are used instead.
Any comment:	

Data / Parameter:	$GEN_{j,y}$
Data unit:	MWh
Description:	Electricity imported to the grid by power source *j* in year of *y*
Source of data used:	China Electricity Power Yearbook
Value applied:	Please refer to annex 3
Justification of the choice of data or description of	The detailed data of fuels consumed by power plants are not available publicly, so the aggregated data by fuel types are used

measurement methods and procedures actually applied :	instead.
Any comment:	

Data / Parameter:	***NCV_i***
Data unit:	TJ/t(ce), TJ/m^3(ce)
Description:	Net calorific value per mass or volume unit of a fuel *i*.
Source of data used:	China Electricity Power Yearbook
Value applied:	Please refer to annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data comes from an official statistic.
Any comment:	

Data / Parameter:	***$EF_{CO2,i}$***
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor per unit of energy of the fuel *i*.
Source of data used:	2006 IPCC Guideline for National Greenhouse Gas Inventories.
Value applied:	Please refer to annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is based on IPCC default value because the national specific value is unavailable.
Any comment:	

B.6.3. Ex-ante calculation of emission reductions:

Step 1: Baseline Emission

The annual net power supply to the North West China Grid is estimated to be 135 GWh.

Application of the formulae in Section B6.1 to the baseline data presented in Annex 3 yields the following results:

$EF_{OM,y}$ of the North West China Grid is 1.0246 tCO_2e/MWh;

$EF_{BM,y}$ of the North West China Grid is calculated as 0.6433 tCO_2e/MWh;

EF_y of the North West China Grid is 0.8340 tCO_2e/MWh;

The annual emission reductions BEy are thus calculated to be 112,910 tCO_2e. (Details referred to annex3)

Step 2: Project Emission

According to Section B6.1, the project emission is zero.

Step 3: Leakage

According to ACM0012, there is no leakage for the proposed project activity.

Step 4: Emission Reductions

In a given year, the emission reductions realized by the project activity (ERy) is equal to baseline GHG emissions (BE_y) minus project direct emissions and leakages during the same year:

$$ER_y = BE_y - PE_y = BE_y$$

Hence, the emission reductions due to the project are equal to baseline emissions. The emission reductions will be calculated ex post on the basis of actual power supply to the grid, using the baseline emission factor presented about in Section B6.1.

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2012	0	112,910	0	112,910
2013	0	112,910	0	112,910
2014	0	112,910	0	112,910
2015	0	112,910	0	112,910
2016	0	112,910	0	112,910
2017	0	112,910	0	112,910
2018	0	112,910	0	112,910
2019	0	112,910	0	112,910
2020	0	112,910	0	112,910
2021	0	112,910	0	112,910
Total (tonnes of CO_2e)	**0**	**1,129,100**	**0**	**1,129,100**

B.7. Application of the monitoring methodology and description of the monitoring plan:

B.7.1. Data and parameters monitored:

Data / Parameter:	$Q_{OE,y}$
Data unit:	GWh
Description:	Quantity of electricity generated by the proposed project activity during year y
Source of data to be used:	Generation plant measurement records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	147,000, which is based on the Feasibility study report for calculating expected ER.
Description of measurement methods and procedures to be applied:	Measurement equipment: the electronic electricity meter Accuracy degree: 0.5s or above. Measurement methods: Online continuous measurement, the value of electricity supply can be accumulated and show on the electricity meter. Recording frequency: Monthly. The recorded data will be archived electronically and kept for two years after the end of the last crediting period.

	Emergency measure: Data cannot be measured because of calibration or the electricity meter is out of order in the crediting period, then emergency measures should be taken. Please refer to section B7.2 for detail information.
QA/QC procedures to be applied:	QA/QC for Monitoring Equipment: Calibrated procedure: Both main meter and backup meter are calibrated by local qualified institution or entity once a year. A calibration report will be provided by local qualified institution or entity calibration of the meter. QA/QC for Data: (1)SDS cannot used electricity meters in the absence of local qualified institution or entity (or its authorized delegates) (2)SDS will arrange operators recording the data monthly. (3)The running parameters of generators can be used to verify.
Any comment:	In the proposed project activity, waste heat is used for power generation. So $Q_{OE,y}$ in this case means the quantity of electricity generated by using the waste heat and it will be used for estimation of f_{cap}.

Data / Parameter:	***EG*$_y$**
Data unit:	MWh
Description:	Quantity of electricity supplied to the grid by the project activity during the year *y* in MWh
Source of data to be used:	Recipient plant(s) and generation plant measurement records.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	135,000, which is based on the Feasibility study report for calculating expected ER.
Description of measurement methods and procedures to be applied:	Measurement equipment: the electronic electricity meter Accuracy degree: 0.2s Measurement methods: Online continuous measurement, the value of electricity supply can be accumulated and show on the electricity meter. Recording frequency: Monthly. The recorded data will be archived electronically and kept for two years after the end of the last crediting period. Emergency measure: Data cannot be measured because of calibration or the electricity meter is out of order in the crediting period, then emergency measures should be taken. Please refer to section B7.2 for detail information.
QA/QC procedures to be applied:	QA/QC for Monitoring Equipment: Calibrated procedure: Both meters are calibrated by local qualified institution or entity once a year. A calibration report will be provided by local qualified institution or entity calibration of the meter. QA/QC for Data: (1) SDS cannot use electricity meters in the absence of local qualified institution or entity (or its authorized delegates). (2) SDS will arrange operators recording the data monthly. (3) The running parameters of generators can be used to verify. (4) Sales records and purchase receipts are used to ensure the

	consistency.
Any comment:	Data shall be measured at the recipient plant(s) and at the generation plant for cross check.

Data / Parameter:	$EC_{PJ,y}$
Data unit:	MWh
Description:	Additional electricity consumed in year y, for any other project related equipment, as a result of the implementation of the project activity.
Source of data to be used:	Recipient plant(s) and generation plant measurement records.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	12,160, which is based on the Feasibility study report for calculating expected ER.
Description of measurement methods and procedures to be applied:	Measurement equipment: the electronic electricity meter Accuracy degree: 0.2s Measurement methods: Online continuous measurement, the value of electricity supply can be accumulated and show on the electricity meter. Recording frequency: Monthly. The recorded data will be archived electronically and kept for two years after the end of the last crediting period. Emergency measure: Data cannot be measured because of calibration or the electricity meter is out of order in the crediting period, then emergency measures should be taken. Please refer to section B7.2 for detail information.
QA/QC procedures to be applied:	QA/QC for Monitoring Equipment: Calibrated procedure: All the meters are calibrated by local qualified institution or entity once a year. A calibration report will be provided by local qualified institution or entity calibration of the meter. QA/QC for Data: (1) SDS cannot used electricity meters in the absence of local qualified institution or entity (or its authorized delegates) (2) SDS will arrange operators recording the data monthly. (3) The running parameters of generators can be used to verify. (4) Sales records and purchase receipts are used to ensure the consistency.
Any comment:	Data shall be measured at the recipient plant(s) and at the generation plant for cross check.

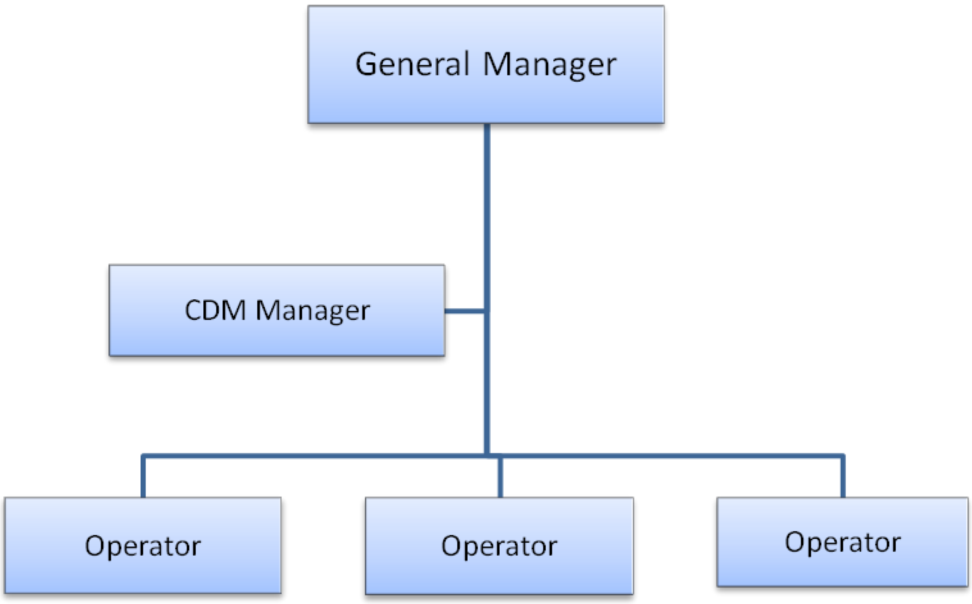
B.7.2. Description of the monitoring plan:

Monitoring tasks must be implemented according to the monitoring plan in order to ensure the real, measurable and long-term greenhouse gas (GHG) emission reduction for the proposed project is monitored and reported.

The monitoring plan is designed for Shaanxi Dongling Waste Energy utilization to Generate Power Project implemented by Shaanxi Dongling Smelting Power Co., Ltd. (Project Owner).

1. The management structure

The management structure is as follow:



General Manager:

General Manager of the project will take charge of the management of the CDM project, take responsibility for Chinese DNA and stakeholders and take charge of the coordination with Annex 1 countries and DOE.

CDM Manager

The CDM monitor manager will be responsible for the operation and management of the proposed CDM project, and responsible for supervising and checking the whole measure and date record process and the calibration of meters. Another main task of the CDM monitor manager is facilitating the verification through providing the DOE with all required information.

Operator

The site engineers will take charge of the regular monitoring work, including monitoring of raw data, data aggregation and processing, statistical calculations and storage of the processed data, and the calibration and maintenance of the measurement equipment.

2. Monitoring requirements

ACM0012 monitoring methodology requires that net electricity supply grid and waste flue gas utilized by the proposed project activity should be monitored. Therefore, the monitoring plan is drafted to focus the two data referred above.

2.1 Monitoring of quantity of waste energy used for energy generation by the project activity

The electricity generated by the proposed project is measured by the electricity meter $Q_{OE,y}$, which calibrated by qualified institution or entity and maintained by SDS. The meter is installed at the exit of the generator for monitoring the electricity generation. All the electricity meters will be properly calibrated annually. The data will be monitored continuously and recorded monthly and archived electronically and kept for two years after the end of the last crediting period.

2.2 Monitoring of Net Electricity Supply to the North West Power Grid and consumed

The electricity supplied to the grid, the electricity generated by the project activity and the electricity consumed by the project activity is all metered by the project owners by national standard electricity meters. An agreement will be signed between the project owner and the grid company that defines the metering arrangements and required quality control procedures to ensure accuracy. According to the power industry standard of electricity meters, the metering equipment will be properly configured and the metering equipment will be checked by both the project owner and the grid company before the project is in operation.

Meters are required, of which, generator link to transformer substation with two generatrixes, which every generatrix installed two meters in the exit. There are two meters in one generatrixe, one is the main meter, and another is the backup meter.

Two meters, the main and the backup, for monitoring parameter $EC_{PJ,y}$ are installed at the power generation plant to measure the electricity consumption by the proposed project activity.

The data from the meter will be used to calculate the emission reduction and if the one of meters has any troubles, the project owner should employ the data monitored by the other generatrix and its meter. And the data will be cross-checked against relevant electricity sale receipts and/or purchase records. Sales receipts will be used for verification.

All the monitored data will be electronically and kept for two years at the end of the last crediting period.

3. Monitoring procedures

3.1 Measurement

Accumulated data for quantity of electricity generated and net electricity supply to the grid will be measured by meters. The accumulated data of meters will be recorded monthly and they will be exported into the database.

3.2 Identification

The trained operators will identify whether the data on the metering equipments is reasonable within 24 hours. And they will frequently inspect the power plant, focusing on the meters. The process will be recorded and provided to DOE on Verification. If the operators find out the data isn't credible, emergency plan will be used. The method of data identification and the detailed procedure are defined on CDM Operational Manual.

- Prepare a monitoring report;

Monitoring manager is responsible to the CDM project director.

4. Measuring methods and procedures

4.1 Calibration

All of the electricity meters installed at both NWCG and the project plant will be calibrated once a year by the qualified institution or testing entity and kept by the project owner. . The process of Meter calibration should be reported. One electricity metering equipment which has been calibrated, will be prepared for replacement of each meter in case any of them doesn't work.

Calibration reports of meters are in charge of CDM manager.

4.2 Accuracy of the measurement

The meter at generator: not exceed 1% of full-scale rating.

The meter at transformer substation: 0.5s.

4.3 Recording frequency/ measurement interval

All the electricity delivered and consumed should be monitored continuously and recorded monthly.

The CDM monitor manager will be responsible for supervising and checking the whole measure and date record process and the calibration of meters.

5. Quality Assurance and Quality Control

The quality assurance and quality control process for recording, maintaining and archiving data will be ensured through the CDM mechanism in terms of the need for verification of emission on an annual basis according to the PDD and monitoring plan.

5.1 For Human Resource Management-------Training Plan

According ACM0012 and the monitoring plan, training activities will be conducted to the management, site engineers covering the project plant's operation and maintenance before the plant is put into delivery. Relevant documentation or other materials such as: background of CDM, contents of PDD and monitoring plan, practical requirements for monitoring, worksheet containing monitoring data and calculation etc. should be archived and provided to DOE for verification. The contents and procedures of quality assurance and quality control is on-going process which will be updated in the crediting period.

5.2 For Monitoring Process ——Computer Execution with Human Supervision

The Monitoring Process will be executed by computer and supervised by operators, in order to avoid artificial errors. The operation report form would be archived. The procedures of copying data will be in line with the methodology and described in CDM Operational Manual. If the abnormal situation happens, the emergency plan will be started up.

5.3 For Emergency Situation

Should any previous month's reading of the Main Meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the net electricity supply to the grid shall be determined by : First, by reading one meter, unless a test by either party reveals it is inaccurate; If the other generatrix system is not within acceptable limits of accuracy or is performing improperly, the project owner and the local grid company shall jointly prepare an estimate of the correct reading, and if the project owner and the local grid company fail to agree the estimate of the correct reading, then the matter will be referred for arbitration according to agreed procedures.

If there is any waste heat that is monitored under abnormal operation (emergencies, shut down) of the plant will not be accounted for. And the quantity of waste heat monitored by the meters under abnormal operation time will be discounted.

6. Data management

The data management will be mainly carried out by the CDM manager who is appointed by the CDM project director of the owner. The data recorded at the project plant will be stored on –site and collected by the CDM manager on a daily basis. Other documents such as the sale receipt and the calibration reports of the monitoring equipment will also be kept by the CDM manager. All original paper-based documents will be kept at least one hand-copy and be recorded electronically.

Data collected on all parameters monitored under the project monitoring plan will be kept for 2 years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

The monitored data will be presented to the verification agency or DOE to whom verification of emission reductions is assigned.

The documents such as maps, and the EIA report, will be used in conjunction with the monitoring plan to check the authenticity of the information, and be kept at least one copy by the CDM monitor manager of the project.

Measuring meters will be utilized and calibrated according to the requirements on B.7.1. In addition, the project owner will train the appointed monitoring manager and monitoring engineers to operate theses meters. The monitoring plan will be incorporated into the existing monitoring system, implemented according to special monitoring manual to ensure reliable, transparent and comprehensive monitoring.

For the net electricity output, measuring meters is installed by the Shaanxi provincial power grid, and the electricity date will be continuously measured and monthly recorded which will rechecked by electricity sale invoice.

Deviations treatment

In case deviations in the monitoring data are found, the Monitoring Engineer will study the operating parameters to identify the reason for the deviation and take remedial measures.

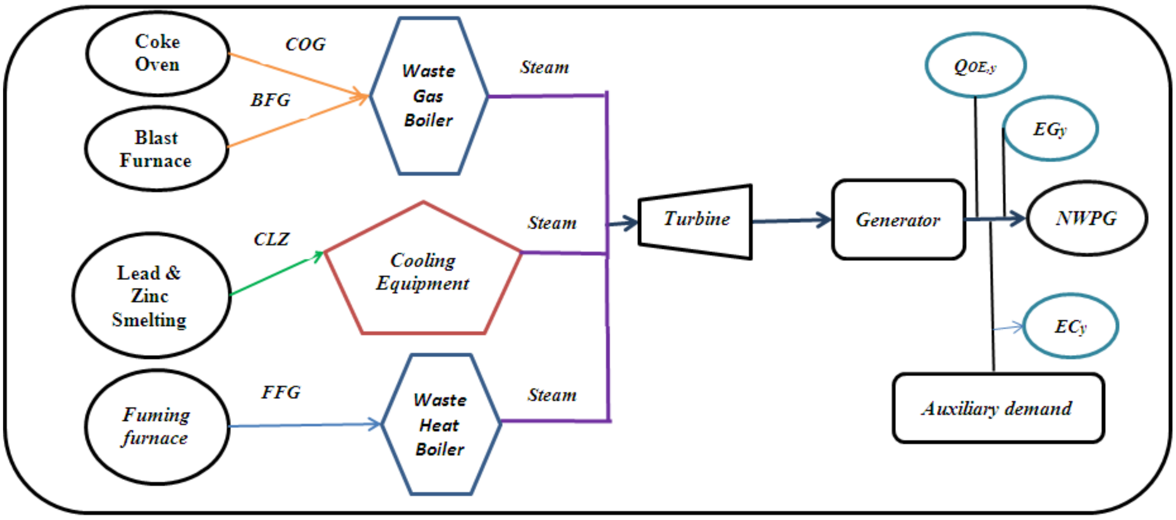
Monitoring data

Some monitoring data will be continually recorded and kept in the electrical archives automatically, and at same time, a paper copy will be created for archives as well, the relevant data will be kept during the crediting period and two years after. Some hard copied should be also kept in the electrical archives; the relevant data will be kept during the crediting period and two years after.

Monitoring report

Monitoring report will be prepared by the monitoring manager and submit to CDM project director for final review, who will submit the report to DOE.

The monitoring plan will be implemented by professional staff authorized by the project sponsor. The managing flow is illustrated as follows:



B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies):

The baseline study and monitoring methodology was completed on 28 May Oct. 2010 by:

Mr. Wen Xuefeng
Tepia Corporation Japan Co., Ltd. Tokyo Branch
Toyo7-2-14, Koto-ku, Tokyo 135-0016, Japan

Phone: +81-3-5857-4862
Fax: +81-3-5857-4863
Email: wenxf@tepia.co.jp

Ms. Onishi Momoko
Tepia Corporation Japan Co., Ltd. Osaka Branch
PHAROS BLG 7F, 1-7-4, Minamihorie, Nishi-ku, Osaka, 550-0015, Japan
Phone: +81-6-6533-8018
Fax: +81-6-6533-8022
Email: momoko@tepia.co.jp

Ms. Tsuji Keiko
Tepia Corporation Japan Co., Ltd. Tokyo Branch
Toyo7-2-14, Koto-ku, Tokyo 135-0016, Japan
Phone: +81-3-5857-4862
Fax: +81-3-5857-4863
Email: wenxf@tepia.co.jp

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

06/01/2010

C.1.2. Expected operational lifetime of the project activity:

15 years

C.2. Choice of the crediting period and related information:

C.2.1. Renewable crediting period:

C.2.1.1. Starting date of the first crediting period:

N.A.

C.2.1.2. Length of the first crediting period:

N.A.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/01/2012

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The *Environmental Impact Assessment* (EIA) of the proposed project has been ratified by Baoji City Environmental Protection Bureau on 31 May 2009. It can not only enhance local economic strength, but also result in prominent environmental and social benefit; therefore, the proposed project is feasible. According to *Feasibility Study Report* and *Environmental Impact Assessment*, environmental impact possibly caused by the proposed project and protect and guard ensure adopted by the project owner are analyzed as follows:

<u>During the Construction period</u>

The proposed project is built in the Changqing Industrial Park， with small construction scale, short construction period and less land construction work. In the construction period, there is a whole fence around the constructed site far from the local populace. The impact of duck and noise during the construction period are very little. The impact on the environment of the proposed project can be neglected.

<u>During the Operation period</u>

(1) Waste gas

The proposed project will operate without new fuels, so, there are no waste gas produced. The waste gas is from prior the implement of the project, which main pollutants are SO_2 and NO_X. The waste gas is desulphurized and dust treatment, and utilizated to generate electricity. Therefore, the impact of waste gas on environment is small.

(2) Waste water

The waste water is mainly the production of the waste water and the life waste water. The production waste water is mainly generated from waste heat boiler and acid/alkali waste water, which can be delivered to sewage plant. Little waste water will be darned away to the water body. Therefore, the impact of waste water on environment is small.

(3) Solid wastes

The gypsum generated in the desulphurization equipment and the solid life wastes are collected and transported outside of the power plant to be disposed according to the requirements of solid waste treatment. For example, the waste residue can be piled up in the natural of Changqing Industrial Park, which is in line with the industrial waste dispose standard GB 18599-2001.

(4) Noise

The noise is mainly from the running of the waste heat boiler, steam turbine, generators and other equipment. The equipments with low noise are chosen, and the silencer is installed at the outlet of the waste heat boiler and other equipments. With proper collocation, the noise impact on the environment will be reduced. Through the above measures, the noise has little impact on the environment.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an

environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

Recovery and utilization of the waste heat for electricity generation is an effective way to realize the clean production of the coking industry. The proposed project plays an important role in improving the local ecological environment.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

The stakeholders' comments will be collected through the following means:

Questionnaire survey

During 12/03/2010 to 21/03/2010, Shaanxi Dongling Smelting Co., Ltd cooperated with CDM developer together put out the soliciting letter of Public Comments and questionnaire survey for the proposed project to the stakeholders. .

Purpose of questionnaire survey

To know the attitude about the proposed project of the public and the local officials near the site, extensively collecting opinions and suggestions of related stakeholders, to receive more reasonable advice for the project implementation.

Questionnaire scope

35 questionnaires were distributed to residents who may be impacted by the project and 35 investigational questionnaires have been returned, percentage of reply is 100%.

The questionnaire scope includes different ages, educational degree, and occupations as following;

Item		Amount
Age	18 years old and under	0
	18~34 years old	28
	35~54 years old	6
	55 years old and over	1
Educational degree	Elementary school	6
	Middle school	12
	High school	16
	College and over	1
Occupation	Student	2
	Farmer	25
	Worker	5
	Other	3

Questionnaire Content

Questionnaire content are shown as following:

1. Do you know the proposed project?
2. Do you think the proposed project will help to improve the local quality of the environment?

3. Is it acceptable if any unfavourable impact on the environments? (if the proposed project meets national standard demand)
4. Do you think the proposed project will be helpful to improve the local economy?
5. Do you think the proposed project will increase employment opportunities?
6. Do you think the proposed project will feasible?
7. Other suggestions or comments.

E.2. Summary of the comments received:

The details of the Questionnaire results are shown in the Table and following:

- 100% of the respondents know the proposed project.
- 91.4% of the respondents think the proposed project will help to improve the local quality of the environment.
- 100% of the respondents accept if any unfavourable impact on the environments (even the proposed project meets national standard demand).
- 94.3% of the respondents think the proposed project will be helpful to improve the local economy.
- 97.1% of the respondents think the proposed project will increase employment opportunities.
- 100% of the respondents think the proposed project will feasible.
- No other suggestions or comments.

No.	Item		Amount	Percentage (%)
1	Do you know the proposed project?	Yes	35	100
		No	0	0
2	Do you think the proposed project will help to improve the local quality of the environment?	Yes	32	91.4
		No	0	0
		Not sure	3	8.6
3	Is it acceptable if any unfavourable impact on the environments? (if the proposed project meets national standard demand)	Yes	35	100
		No	0	0
4	Do you think the proposed project will be helpful to improve the local economy?	Yes	33	94.3
		No	0	0
		Not sure	2	5.7
5	Do you think the proposed project will increase employment opportunities?	Yes	34	97.1
		No	0	0
		Not sure	1	2.9
6	Do you think the proposed project will feasible?	Yes	35	100
		No	0	0
7	Other suggestions or comments.		Nothing	

In conclusion, the publics accept the project, as a contributable undertaking to the local economy as the surveyed results of other CDM projects registered.

E.3. Report on how due account was taken of any comments received:

No any modifications is necessary for the project planning due to the comments received since most of responses support the construction and implementation of the project without any amendment of the mentioning in full or partial.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Shaanxi Dongling Smelting Co., Ltd.
Street/P.O.Box:	Changqing Industrial Park, Changqing Town, Fengxiang County
Building:	
City:	Baoji City
State/Region:	Shaanxi Province
Postcode/ZIP:	721405
Country:	China
Telephone:	+86-917-3452659
FAX:	+86-917-3452037
E-Mail:	zhyi@bsjt.net
URL:	www.dljt.net
Represented by:	Yi Zhao
Title:	Director
Salutation:	Ms
Last name:	Zhao
Middle name:	
First name:	Yi
Department:	The Office of Foreign Handing
Mobile:	+86-13609171308
Direct FAX:	+86-917-3452037
Direct tel:	+86-917-3452659
Personal e-mail:	zhyi@bsjt.net

Organization:	Tepia Corporation Japan Co., Ltd.
Street/P.O.Box:	1-7-4-7, Minamihorie, Nishi-ku
Building:	7F, PHAROS Building
City:	Osaka city
State/Region:	Osaka prefecture
Postfix/ZIP:	550-0015
Country:	Japan
Telephone:	+81-6-6533-8018
FAX:	+81-6-6533-8022
E-Mail:	info@tepia.co.jp
URL:	http://www.tepia.co.jp
Represented by:	
Title:	General Manager
Salutation:	Mr.
Last Name:	Wen
Middle Name:	-
First Name:	Xuefeng
Department:	Tokyo Branch
Mobile:	-
Direct FAX:	+81-3-5857-4863
Direct tel:	+81-3-5857-4862
Personal E-Mail:	wenxf@tepia.co.jp

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from parties in Annex 1 is involved in this project activity.

Annex 3

BASELINE INFORMATION

Northwest China Power Grid (NWPG) 2002～2006 generation composition

Year		Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total	Thermal share	Other share
	unit	TWh	TWh	TWh	TWh	TWh	TWh	%	%
2003	Total generation	8,878	8,047	4,246	3,420	5,494	29,997	68.3	31.7
	Thermal	7,326	4,745	905	3,102	4,413	20,492		
2004	Total generation	9,516	8,679	4,943	4,190	6,028	33,358	66.7	33.3
	Thermal	7,640	4,975	889	3,782	4,959	22,247		
2005	Total generation	10,756	9,860	5,711	5,117	6,536	37,981	69.4	30.6
	Thermal	9,132	5,715	886	4,577	5,051	26,362		
2006	Total generation	11,888	10,938	6,940	6,442	7,892	44,100	67.2	32.8
	Thermal	9,723	6,448	1,517	6,002	5,937	29,627		

Data Source: China electricity year book 2003～2007.

OM	tCO_2/MWh	1.0246
BM	tCO_2/MWh	0.6433

Data Source: China DNA, http://cdm.ccchina.gov.cn/

NWPG simple OM calculation in 2005

fuel type	Unit	Shanxi A	Gansu B	Qinghai C	Ningxia D	Xinjiang E	Sub-total F=A+B+C+D+E	Emission factor (tc/TJ) G	OXID (%) H	NCV (MJ/t，km3) I	Emission(tCO_2e) J=G*H*I*44/12/10000 mass unit J=G*H*I*44/12/1000 volume unit
Raw coal	10*kt	2461.28	1597	345.1	1467.7	1358.09	7229.17	25.8	100	20,908	142,985,522
Washed coal	10*kt	16.22					16.22	25.8	100	26,344	404,225
Other coal	10*kt	35.56			101.95	10.2	147.71	25.8	100	8,363	1,168,593
Coke	10*kt	3.23					3.23	29.2	100	28,435	98,335
Coke oven gas	100*Mm^3						0	12.1	100	16,726	0
Other oven gas	100*Mm^3						0	12.1	100	5,227	0
Crude oil	10*kt					0.18	0.18	20	100	41,816	5,520
Gasoline	10*kt	0.02				0.03	0.03	18.9	100	43,070	895
diesel	10*kt	2.24	0.46	0.06		3.26	3.26	20.2	100	42,652	102,986
Fuel oil	10*kt	0.01	0.57			0.83	0.83	21.1	100	41,816	26,852
LPG	10*kt					0	0	17.2	100	50,179	0
Refinery gas	10*kt					7.71	7.71	15.7	100	46,055	204,410
Natural gas	100*Mm^3	1.46	0.52	1.33		11.12	11.12	15.3	100	38,931	2,428,410
Other oil	10*kt					0	0	20	100	38,369	0
Other coke	10*kt					0	0	25.8	100	28,435	0
others	10*ktce	8.24	1.3			9.54	9.54	0	100	0	0
										Sub-total	147,425,979

Data source: China Energy Statistical Yearbook 2006.

NWPG simple OM calculation in 2006

fuel type	Unit	Shanxi	Gansu	Qinghai	Ningxia	Xinjiang	Sub-total	Emission factor (tc/TJ)	OXID (%)	NCV (MJ/t，km3)	Emission(tCO_2e) J=G*H*I*44/12/10000 mass unit
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J=G*H*I*44/12/1000 volume unit
Raw coal	10*kt	2834.44	1660.92	421.86	1823.72	1547.69	8298.63	25.8	100	20,908	164,138,337
Washed coal	10*kt						0	25.8	100	26,344	0
Other coal	10*kt				112.7	8.45	121.15	25.8	100	8,363	958,466
Coke	10*kt				0.01		0.01	29.2	100	28,435	304
Coke oven gas	$100*Mm^3$	0.2				0.08	0.28	12.1	100	16,726	20,778
Other oven gas	$100*Mm^3$	0.1					0.1	12.1	100	5,227	2,319
Crude oil	10*kt					0.02	0.02	20	100	41,816	613
Gasoline	10*kt	0.01					0.01	18.9	100	43,070	298
diesel	10*kt	1.14	0.24	0.61		1.25	3.24	20.2	100	42,652	102,355
Fuel oil	10*kt		0.6			0.11	0.71	21.1	100	41,816	22,970
LPG	10*kt						0	17.2	100	50,179	0
Refinery gas	10*kt						0	15.7	100	46,055	0
Natural gas	$100*Mm^3$	1.59	0.56	1.06		7.49	10.7	15.3	100	38,931	2,336,911
Other oil	10*kt						0	20	100	38,369	0
Other coke	10*kt	1.86					1.86	25.8	100	28,435	50,033
others	10*ktce	33.57	8.81			2.2	44.58	0	100	0	0
										Sub-total	167,633,385

Data source: China Energy Statistical Yearbook 2007.

NWPG simple OM calculation in 2007

fuel type	Unit	Shanxi	Gansu	Qinghai	Ningxia	Xinjiang	Sub-total	Emission factor (tc/TJ)	OXID (%)	NCV (MJ/t，km3)	Emission(tCO_2e) J=G*H*I*44/12/10000 mass unit
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J=G*H*I*44/12/1000 volume unit
Raw coal	10*kt	3303.44	1969.03	470.85	2165.8	1762.11	9671.23	25.8	100	87,300	20,908
Washed coal	10*kt						0	25.8	100	87,300	26,344
Other coal	10*kt	3.73			124.31	7.73	135.77	25.8	100	87,300	8,363
Coke	10*kt	3.53					3.53	26.6	100	87,300	20,908
Coke oven gas	100*Mm^3						0	29.2	100	95,700	28,435
Other oven gas	100*Mm^3	0.52	0.65			0.26	1.43	12.1	100	37,300	16,726
Crude oil	10*kt	14.14	0.71				14.85	12.1	100	37,300	5,227
Gasoline	10*kt					0.09	0.09	20	100	71,100	41,816
diesel	10*kt	0.02					0.02	18.9	100	67,500	43,070
Fuel oil	10*kt	1.12	0.26	0.42		1.77	3.57	20.2	100	72,600	42,652
LPG	10*kt	0.01	1.05	0.04		0.05	1.15	21.1	100	75,500	41,816
Refinery gas	10*kt						0	17.2	100	61,600	50,179
Natural gas	100*Mm^3					5.99	5.99	15.7	100	48,200	46,055
Other oil	10*kt	1.68	0.49	1.93		8.66	12.76	15.3	100	54,300	38,931
Other coke	10*kt						0	20	100	75,500	41,816
others	10*ktce						0	25.8	100	95,700	28,435
		94.36	9.73				104.09	0	0	0	0

Data source: China Energy Statistical Yearbook 2008.

NWPG thermal generation in 2005

Province	Generation (MWh)	Self consumption rate(%)	Delivery generation (MWh)
Shanxi	41,100,000	7.16	38,157,240
Gansu	33,106,000	4.23	31,705,616
Qinghai	5,500,000	2.69	5,352,050
Ningxia	27,643,000	5.73	26,059,056
Xingjiang	26,560,000	8.8	24,222,720
Total			125,496,682

Data source: China Electric Power Yearbook 2006.

NWPG thermal generation in 2006

Province	Generation (MWh)	Self consumption rate (%)	Delivery generation (MWh)
Shanxi	54,482,000	6.97	50,684,605
Gansu	35,738,000	4.29	34,204,840
Qinghai	7,204,000	2.57	7,018,857
Ningxia	36,731,000	0	36,731,000
Xingjiang	29,901,000	8.02	27,502,940
Total			156,142,241

Data source: China Electric Power Yearbook 2007.

NWPG thermal generation in 2007

Province	**Generation** (MWh)	**Self consumption rate** (%)	**Delivery generation** (MWh)
Shanxi	59,100,000	6.77	55,098,930
Gansu	42,400,000	5.89	39,902,640
Qinghai	9,700,000	7.19	9,002,570
Ningxia	43,500,000		43,500,000
Xingjiang	34,600,000	9.2	31,416,800
Total			178,920,940

Data source: China Electric Power Yearbook 2008.

Year	Total emission tCO_2	Total Generation MWh	Emission Factor
2005	147,425,979	125,496,682	1.17474
2006	167,633,385	156,142,241	1.07359
2007	180,940,805	178,920,940	1.01129
The average Emission Factor for last three year： EF_{OM}= 1.02462 tCO_2/MWh			

Calculation of BM emission factor of the North West Power Grid(NWPG)

Step (1): Calculation of the share of CO_2 emissions from solid, liquid and gaseous fuels.

$$\lambda_{COAL,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}} \quad (3)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}} \quad (4)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,j} \times EF_{CO2,i,j,y}} \quad (5)$$

Where:

$F_{i,j,y}$ is the amount of fuel i (tce) consumed by plant m in year y;

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

$EF_{CO2,i,y}$ is CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)

Coal, Oil and Gas is the foot-index for solid fuels, liquid fuels and gas fuels.

Step (2): **Calculation the emission factor of thermal power.**

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (6)$$

$EF_{Coal,Adv}$、$EF_{Oil,Adv}$、$E_{FGas,Adv}$ represent the emission factors of the best efficient and commercial coal-fired, oil-fuel and gas-fuel generation technologies.

Step (3): **Calculation BM in the grid.**

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (7)$$

Where:

CAP_{Total} is the total added installed capacity;

$CAP_{Thermal}$ is the total added installed capacity for thermal power.

Step (1): Calculation of the share of CO_2 emissions from solid, liquid and gaseous fuels.

Fuel type	Unit	Shanxi	Gansu	Qinghai	Ningxia	Xinjiang	Sub-total	Emission factor	OXID	NCV	Emission(tCO_2e)
								(tc/TJ)	(%)	($MJ/t,km^3$)	J=G*H*I*44/12/10000 mass unit
		A	B	C	D	E	F=A+B+C +D+E	G	H	I	J=G*H*I*44/12/1000 volume unit
Coal	10*kt	3,303.44	1,969.03	470.85	2,165.80	1,762.11	9,671.23	20,908	87,300	1	176,525,905
Cleaned coal	10*kt	0	0	0	0	0	0	26,344	87,300	1	0
Other washed coal	10*kt	3.73	0	0	124.31	7.73	135.77	8,363	87,300	1	991,243
Mould coal	10*kt	3.53	0	0	0	0	3.53	20,908	87,300	1	64,432
Coke	10*kt	0	0	0	0	0	0	28,435	95,700	1	0
Other coking	10*kt	0	0	0	0	0	0	28,435	95,700	1	0
Sub											**177,581,580**
Crude oil	10*kt	0	0	0	0	0.09	0.09	41,816	71,100	1	2,676
Gasoline	10*kt	0.02	0	0	0	0	0.02	43,070	67,500	1	581
Diesel	10*kt	1.12	0.26	0.42	0	1.77	3.57	42,652	72,600	1	110,546
Fuel oil	10*kt	0.01	1.05	0.04	0	0.05	1.15	41,816	75,500	1	36,307
Other oil fuel	10*kt	0	0	0	0	0	0	41,816	75,500	1	0
Sub											**150,110**
Natural gas	$100*Mm^3$	16.8	4.9	19.3	0	86.6	127.6	38,931	54,300	1	2,697,404
Over gas	$100*Mm^3$	5.2	6.5	0	0	2.6	14.3	16,726	37,300	1	89,215
Other gas	$100*Mm^3$	141.4	7.1	0	0	0	148.5	5,227	37,300	1	289,526
LPG	10*kt	0	0	0	0	0	0	50,179	61,600	1	0
Refinery gas	10*kt	0	0	0	0	5.99	5.99	46,055	48,200	1	132,969
Sub											**3,209,114**
Total											**180,940,805**

Data source: China Energy Statistical Yearbook 2007.

Calculation according to the above table and equation (5),(6)and(7):

$\lambda_{Coal,y}$ =98.14%，$\lambda_{Oil,y}$ =0.010%，$\lambda_{Gas,y}$ =1.77%。

Step (2): Calculation of the emission factor of thermal power.

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal.Adv,y} + \lambda_{Oil,y} \times EF_{Oil.Adv,y} + \lambda_{Gas,y} \times EF_{Gas.Adv,y} = 0.8170 \text{ tCO}_2\text{/MWh}$$

Step (3): **Calculation of BM in the grid.**

NWPG Installed Capacity in 2007

Installed Capacity	Unit	Shanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	MW	12,290	7,840	1,900	7,030	6,560	35,620
Hydro	MW	1,790	4,400	5,830	430	2,140	14,590
Nuclear	MW	0	0	0	0	0	0
Wind farm and other	MW	72.5	346	0	50	330	798.5
Total	MW	14,152.5	12,586	7,730	7,510	9,030	51,008.5

Data source: China Electric Power Yearbook 2008

NWPG Installed Capacity in 2006

Installed Capacity	Unit	Shanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	MW	9,723	6,448	1,517	6,002	5,937	29,627
Hydro	MW	2,165	4,291	5,423	429	1,766	14,074
Nuclear	MW	0	0	0	0	0	0
Wind farm and other	MW	0	199	0	11	189	399
Total	MW	11,888	10,938	6,442	7,892	7,892	44,100

Data source: China Electric Power Yearbook 2007

NWPG Installed Capacity in 2005

Installed Capacity	Unit	Shanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	MW	9,132.1	5,715	886.8	4,577	5,051.7	25,362.6
Hydro	MW	1,578	4,036.2	4,825	428.5	1,352.1	12,219.8
Nuclear	MW	0	0	0	0	0	0
Wind farm and other	MW	46	109.1	0	112.2	132.2	399.5
Total	MW	10,756.1	9,860.3	5,711.8	5,117.7	6,536	37,981.9

Data source: China Electric Power Yearbook 2006

NWPG Installed Capacity in 2004

Installed Capacity	Unit	Shanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total
Thermal power	MW	7,640.4	4,975.6	889.8	3,782	4,959.7	22,247.5
Hydro	MW	1,876.5	3,566.1	4,053.4	366.2	973	10,835.2
Nuclear	MW	0	0	0	0	0	0
Wind farm and other	MW	0	138.2	0	42.5	95.3	276
Total	MW	9,516.9	8,679.9	4,943.2	4,190.7	6,028	33,358.7

Data source: China Electric Power Yearbook 2005

NWPG BM Calculation

	installed capacity of 2005	installed capacity of 2006	Installed capacity of 2007	Newly installed capacity from 2005 to 2007	Share of the Newly installed capacity
	A	B	C	D=C-B	
Thermal(MW)	25,362.6	29,627	35,620	10,257.4	78.74%
Hydro(MW)	12,219.8	14,074	14,590	2,370.2	18.20%
Nuclear(MW)	0	0	0	0	0.00%
Wind farm(MW)	399.5	399	798.5	399	3.06%
Total (MW)	**37,981.9**	**44,100**	**51,008.5**	**13,026.6**	**100.00%**
Percent of the installed capacity of 2007	74.46%	86.46%	100%		

EFBM,y = 0.8170×78.74%=0.6433 tCO_2/MWh

Annex 4

MONITORING INFORMATION

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