CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Title: Biogas Utilization Project in Zhejiang Jingxing Paper Joint Stock Co. Ltd.
Version of PDD: Version 2.2
Date of document: 13/07/2011

A.2. Description of the small-scale project activity:

The main purpose of the project activity (hereafter also referred to as Project) is to install a biogas-capturing device and a biogas based electricity generation system in the existing wastewater treatment systems at the paper mill of Zhejiang Jingxing Paper Joint Stock Co. Ltd. Zhejiang Jingxing Paper Joint Stock Co. Ltd. has two production lines with total paper production capacity of 600,000 tons per year. The production process produces up to 5,013,640 m^3 of wastewater per year, which is sent to an onsite wastewater treatment system. As a part of the treatment process, the anaerobic digester system releases a methane rich biogas. The current anaerobic wastewater treatment system reduces the COD concentration of the wastewater from 4,095 mg/l to 910 mg/l. After the anaerobic digesters the wastewater passes through an aerobic treatment stage before it is discharged into the municipal wastewater treatment plant for further treatment through a channel.

The scenario existing prior to the start of the implementation of the project activity
Zhejiang Jingxing Paper Joint Stock Co. Ltd. has two wastewater treatment plants with annual capacity of 5,100,000 tonnes. The wastewater treatment system (anaerobic and aerobic system) reduces the COD content of the wastewater from 4,095mg/l to less than 500mg/l before it goes to further treatment in municipal wastewater treatment plant, fulfilling the requirements of national standard GB8978-1996 Stage III. Anaerobic digesters integrated generate about 13,000~15,000m^3 of biogas everyday. The existing wastewater treatment systems at the paper mill of Zhejiang Jingxing Paper Joint Stock Co. Ltd. have no biogas recovery devices and the methane-rich biogas was released to the atmosphere in the baseline scenario. Additionally, the electricity consumption of paper mills as well as the power consumption of wastewater treatment plants is 100% supplied by East China Power Grid (ECPG). As to the sludge disposal, paper fibre sludge is fully recycled as pulp for paper production, and other sludge is being provided for free to another company, and the sludge is being used as material for the productions of brick as well as other possible new products. Transportation/disposal of the sludge is controlled as per the agreements between two parties and fulfilling national regulations/requirements.

The project scenario, including a summary of the scope of activities/measures that are being implemented within the proposed project activity
After implementation of the project activity, the biogas will be used for electricity generation. Power generated will be 100% consumed within the paper mill (e.g. firstly the wastewater treatment facilities and the production lines in the paper mill) displacing the same amount of electricity from ECPG by reducing the import of power to the plant. The project activity consists of implementing a biogas recovery system, a biogas purification device, and a power generation system. The biogas purification through desulphurization devices is required for utilisation of the biogas as a fuel. In total, 2MW generation capacity will be installed, i.e. four 500 kW gas-fired engines will be installed, one of which will be a back up in order to meet the varied flow of biogas. The project activity is expected to displace 10,914 MWh of

electricity per year by reducing the import from the grid to the plant. The sludge disposal will remain the same as in the baseline scenario.

For more technical details, please refer to Section A.4.2 of this PDD.

The baseline scenario
Baseline scenario is same as situation existing prior to the project activity. For more information of baseline identification please refer to Section B.4 of this PDD.

How emission reductions will be achieved
The project activity will lead to green house gas (GHG) emission reductions in a twofold manner: (a) it will avoid methane emissions by capturing the biogas and using it as a fuel, and (b) it will displace fossil fuel based electricity from the Grid. The project activity is expected to avoid 52,185 tCO2e per year by capturing the biogas and around 8,392 tCO2e per year through displacement of electricity from the grid. The total expected amount of emission reductions is 60,577 tCO2e.

Information Regarding Technology Transfer and Knowledge Innovation
Implementation of the proposed project involves imports of advanced ignition system ALTRONIC in USA, which can ensure the safety and controllability of the ignition system[1]. The concept of Clean Production Pattern and recycling economy being put into practice is still very advanced in paper industry of China, particularly the biogas-based electricity generation system.

Contribution to Sustainable Development of the Project

- Employment (including job quality, fulfilment of labour standards)
  The project leads to employment generation in the power plant itself and in the implementation as a CDM project. These jobs do have a significant impact on job quality because most positions generated by proposed project are monitoring role and roles of operating of advanced equipments, computers and sophisticated equipments.
- Human and institutional capacity (including empowerment, education, involvement, gender)
  People involved are trained with skills for operation of the power generation facility and knowledge of Kyoto Protocol. This is the first time local people in are organised to work on a project under the Kyoto Protocol.
- Employment (numbers)
  Proposed project generates 10 working positions.
- Technological self-reliance (including project replicability, hard currency liability, institutional capacity, technology transfer)
  Implementation of the proposed project involves imports of advanced ignition system from USA. The project showcases an innovative way to use biogas from wastewater plant for power generation in paper industry of China. This is the first wastewater treatment and biogas utilization project in paper industry in Zhejiang province that applied for CDM project, and also, this is the first time local enterprise is introduced in the global collaboration against climate change in a sustainable manner.

[1] Please refer to the Technical Specification of Zibo Diesel Engine New Energy Co. Ltd. P13.

A.3. Project participants:

The parties involved in the Project are the following:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R. China (host)	**Zhejiang Jingxing Paper Joint Stock Co. Ltd.**	**No**
Switzerland	**Swiss Carbon Assets Ltd.**	**No**

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

People's Republic of China

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

Zhejiang Province

A.4.1.3. City/Town/Community etc:

Caoqiao Avenue, Pinghu City

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The proposed project is located at Pinghu, Jiaxing Municipality, Zhejiang Province, People's Republic of China. The project has geographical coordinates of E120.9501and N30.6992[2].

[2] Location of the power house, which is the center of the project site.

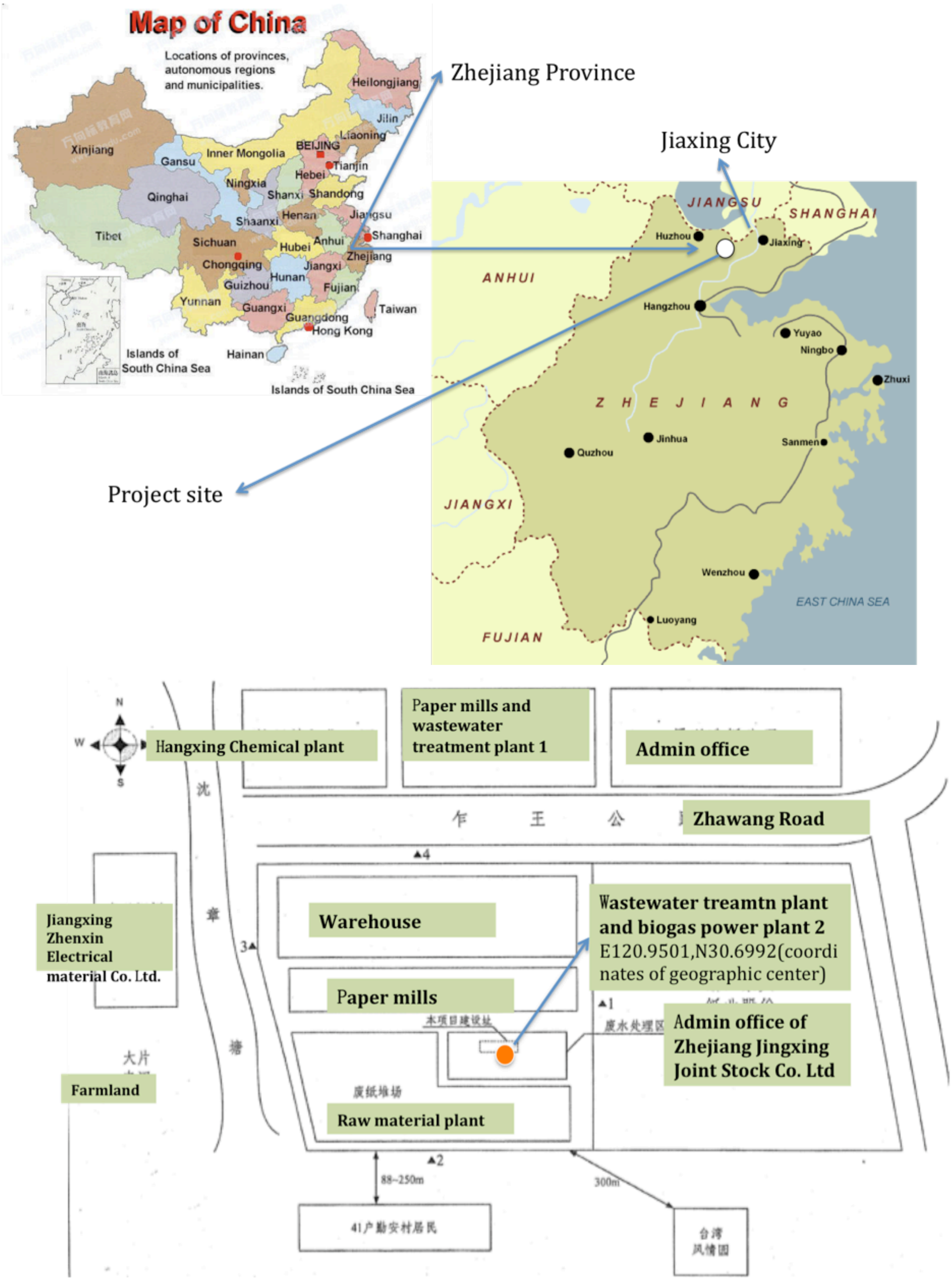

Figure 1. Location of the proposed project

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

Type and category:
According to Appendix B to the *Simplified Modalities and Procedures for Small-Scale CDM Project Activities*, the Project type and categories are defined as follows:

Methane avoidance component:

Type III: Other project activities
Category III.H: Methane Recovery in Wastewater Treatment
Sectoral Scope 13: Waste handling and disposal

Electricity generation component:

Type I: Renewable energy projects
Category I.F: Renewable electricity generation for captive use and mini-grid
Sectoral Scope 1: Energy industries (renewable /non-renewable sources)

Technology
Figure 2 shows the schematic diagram of the project. The proposed project is to install a biogas recovery and utilization system to the existing wastewater treatment facilities. It consists of a biogas recovery system (two biogas storage tanks and one flare device at plant 2, one biogas pocket and flare device at plant 1), a biogas purification system (a sulphur removal unit), and a power generation system at Plant 2 (four sets of methane/biogas fired internal combustion engines and generators will be installed).

Biogas recovery system

Biogas from the existing wastewater treatment systems is collected by the project's recovery system in Plant 1 (where one biogas pocket is installed with flare device for emergency) and Plant 2 respectively. Biogas collected from Plant 1 is piped to Plant 2 (where two biogas storage tanks are installed with flare device for emergency). Biogas from Plant 1 and 2 is mixed together in Plant 2's storage tanks before it goes to the sulphur removal system and gas pre-processing system. And finally the treated biogas is utilized at the power generations at the site of Plant 2.

Sulphur removal system

A wet scrubber system will be applied to remove the sulphur in the captured biogas effectively. The H2S containing gas enters the absorption section and is washed by scrubbing liquid. The liquid has an alkaline nature and absorbs the H2S. The biogas exits the top of the absorber virtually free of H2S. The sulfide containing liquid flows into the bioreactor. In the reactor bacteria oxidize the sulfide with oxygen. The sulfur is then removed by use of a settler. The sulfide free liquid returns to the absorption section.

Power generation system

The biogas desulphurized will be taken into the gas engines for electricity generation directly. The total installed capacity of the power generation system is 1.5 MW, containing four 500kw gas engines (one is for back-up use). The electricity produced will be fully consumed on site to support the generation demand of the wastewater treatment plant.

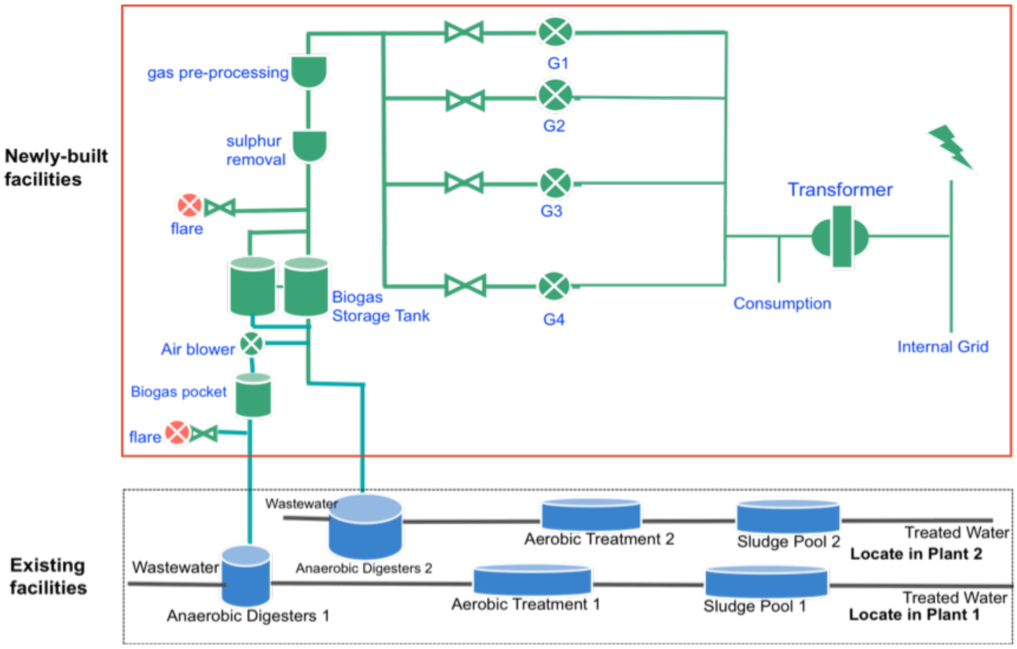

Figure 2. Schematic Diagram of the Project

Following table A.1,A.2shows the key parameters of the generators

Table A.1 Key parameters of Project (Generators)

Model	500GF1	TH500-12/1180
Unit	2*	2*
Manufacturer	Shengli Power Machinery Co. Ltd.	Zibo Diesel Engine New Energy Co. Ltd.
Engine Speed	1000rpm	500 rpm
Rated Frequency	50Hz	50 Hz
Rated Voltage	400V	400V
Plant Load factor	0.83[3]	
Power factor	0.8	0.8
Operation life time	15	15
Generator Power (kW, at 100% load)	500KW	500KW

- Note: One of the generators serves as a back-up generator.

Table A.2 Key parameters of Project (Sulphur removal)

Model	THIOPAQ
Unit	1
Manufacturer	Paques Environmental Technology (Shanghai) Co., Ltd.

[3] Derived from FSR approval from local government. According to the FSR approval, the approved yearly electricity production is 10914 MWh. With yearly operation hours of 7276 hours (= 10914 MWh/1.5 MW), the Plant Load Factor is 83% (= 7276 hours /8760 hours).

Model	THIOPAQ
Designed capacity	20,000Nm^3/d

Environmentally safe and sound technology and knowhow
Design of the project was done by China CEC Engineering Co., Ltd[4]. Founded in 1953, the company is an A Class large-scale designing entity. Design of the project was performed in compliance with "Health Standards for Design of Industrial Facilities", "Standards of Noise for Design of Industrial Facilities" and "Regulations of Safety Insurance for Light Industries". Fireproofing, lightening protection and noise arresting measures have been taken into account. All staff has been trained with "*Operation Manual for Biogas-to-energy Plant*" for normal operation. A biogas detector will be installed at the workshop, which will start in case of biogas leakage. All major equipments have intrinsic emergency shut down systems that are linked to each other. Any serious malfunction in a machine will lead to shut down of the whole system.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

The estimated amount of emission reductions from the small-scale project activity over the chosen crediting period is shown in the following Table A.4, the crediting period will start from 01/10/2011:

Table A.3 Estimation amount of emission reductions

Years	Estimation of annual emission reductions (tCO_2e)
01/10/2011-31/12/2011	15,144
01/01/2012-31/12/2012	60,577
01/01/2013-31/12/2013	60,577
01/01/2014-31/12/2014	60,577
01/01/2015-31/12/2015	60,577
01/01/2016-31/12/2016	60,577
01/01/2017-31/12/2017	60,577
01/01/2018-31/12/2018	60,577
01/01/2019-31/12/2019	60,577
01/01/2020-31/12/2020	60,577
01/01/2021-30/09/2021	45,433
Total estimated reductions (tonnes of CO_2 e)	605,770
Total number of crediting years	**10**
Annual average over the crediting period of estimated reductions (tones of CO_2 e)	**60,577**

A.4.4. Public funding of the small-scale project activity:

The project does not receive any public funding from both Parties. The project does not use ODA directly or indirectly. The project owner, Zhejiang Jingxing Paper Joint Stock Co., Ltd will fully fund the project by itself through equity.

[4] http://www.cecchina.com/en/index.html

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

The project participants confirm that there is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity with the same project participants and whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

According to Appendix C to the *Simplified Modalities and Procedures for Small-scale CDM Project Activities*, the Project is not a debundled component of a large-scale 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 small-scale project activity:

Methane avoidance component:
The approved CDM small-scale baseline and monitoring methodology AMS III.H "Methane Recovery in Wastewater Treatment" (Version 15) is applied to the methane avoidance component of the project activity.

Electricity generation component:
The approved CDM small-scale baseline and monitoring methodology AMS-I.F "Renewable electricity generation for captive use and mini-grid" (Version 01) is applied to the electricity generation component of the project activity.

For more information on both methodologies, please refer to the link:
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

For calculation of the combined margin baseline emission factor, the methodological tool "Tool to calculate the emission factor for an electricity system" (Version 02) is used.

For more information, please refer to the link:
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.pdf

B.2 Justification of the choice of the project category:

The approved small-scale methodology AMS-III.H version 15 is applicable to the project activity (methane component) due to following reasons showed in the Table B.1.

Table B.1 Applicability check (methane recovery component)

NO.	Technology/measure	In the case of the project activity	Applicability
1	This methodology comprises measures that recover biogas from biogenic organic matter in wastewater by means of one, or a combination, of the following options: (a) Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with biogas recovery and combustion; (b) Introduction of anaerobic sludge treatment system with biogas recovery and combustion to a wastewater treatment plant without sludge treatment; (c) Introduction of biogas recovery and combustion to a sludge treatment system; (d) Introduction of biogas recovery and	The project activity only involves the installation and implementation of the biogas recovery and utilization system in the existing anaerobic reactor on site of the wastewater water treatment.	Applicable (d).

	combustion to an anaerobic wastewater treatment system such as anaerobic reactor, lagoon, septic tank or an on site industrial plant; (e) Introduction of anaerobic wastewater treatment with biogas recovery and combustion, with or without anaerobic sludge treatment, to an untreated wastewater stream; (f) Introduction of a sequential stage of wastewater treatment with biogas recovery and combustion, with or without sludge treatment, to an anaerobic wastewater treatment system without biogas recovery (e.g. introduction of treatment in an anaerobic reactor with biogas recovery as a sequential treatment step for the wastewater that is presently being treated in an anaerobic lagoon without methane recovery).		
2	In cases where baseline system is anaerobic lagoon the methodology is applicable if: (a) The lagoons are ponds with a depth greater than two meters, without aeration. The value for depth is obtained from engineering design documents, or through direct measurement, or by dividing the surface area by the total volume. If the lagoon filling level varies seasonally, the average of the highest and lowest levels may be taken; (b) Ambient temperature above 15°C, at least during part of the year, on a monthly average basis; (c) The minimum interval between two consecutive sludge removal events shall be 30 days.	Prior to the installation of the project activity, the biogas produced from the existing anaerobic reactors will be released directly to the atmosphere without capture.	Not relevant.
3	The recovered biogas from the above measures may also be utilised for the following applications instead of combustion/flaring: (a) Thermal or mechanical, electrical energy generation directly; (b) Thermal or mechanical, electrical energy	In case of the project activity, captured biogas will be treated and utilized directly for electricity generations.	Applicable (a).

	generation after bottling of upgraded biogas, in this case additional guidance provided in Annex 1 shall be followed; or (c) Thermal or mechanical, electrical energy generation after upgrading and distribution, in this case additional guidance provided in Annex 1 shall be followed: (i) Upgrading and injection of biogas into a natural gas distribution grid with no significant transmission constraints; (ii) Upgrading and transportation of biogas via a dedicated piped network to a group of end users; or (iii) Upgrading and transportation of biogas (e.g. by trucks) to distribution points for end users. (d) Hydrogen production;		
4	If the recovered biogas is used for project activities covered under paragraph 3 (a), that component of the project activity can use a corresponding methodology under Type I.	Since the biogas captured will be used for electrical energy generation directly for this project activity, methodology under Type I should be used for the electricity generation components. Therefore, AMS.I.F is applied for the project activity. For the detailed analysis of applicability of AMS.I.F, please refer to table B.2.	Applicable.
5	If the biogas is utilized for the production of hydrogen (project activities covered under paragraph 3(d), that component of the project activity shall use correstponding methodology AMS-III.O.	In case of the project activity, captured biogas will be treated and utilized directly for electricity generations.	Not relevant.
6	For project activities covered under paragraph 3 (b), if bottles with upgraded biogas are sold outside the project boundary,	In case of the project activity, captured biogas will be treated	Not relevant.

	the end-use of the biogas shall be ensured via a contract between the bottled biogas vendor and the end-user. No emission reductions may be claimed from the displacement of fuels from the end use of bottled biogas in such situations. If however the end use of the bottled biogas is included in the project boundary and is monitored during the crediting period CO_2 emissions avoided by the displacement of fossil fuel can be claimed under the corresponding Type I methodology, e.g. AMS-I.C "Thermal energy production with or without electricity".	and utilized directly for electricity generations.	
7	For project activities covered under paragraph 3 (c) (i), emission reductions from the displacement of the use of natural gas are eligible under this methodology, provided the geographical extent of the natural gas distribution grid is within the host country boundaries.	In case of the project activity, captured biogas will be treated and utilized directly for electricity generations.	Not relevant.
8	For project activities covered under paragraph 3 (c) (ii), emission reductions for the displacement of the use of fuels can be claimed following the provision in the corresponding Type I methodology, e.g. AMS-I.C.	In case of the project activity, captured biogas will be treated and utilized directly for electricity generations.	Not relevant.
9	For project activities covered under paragraph 3 (b) and (c), this methodology is applicable if the upgrade is done using one of the following technologies such that the methane content of the upgraded biogas is in accordance with relevant national regulations (where these exist) or , in the absence of the national regulations, a minimum of 96% (by volume). These conditons are necessary to ensure that the recovered biogas is completely destroyed through combustion in an end use: ● Pressure Swing Absorption ● Absorption with/without water circulation ● Absorption with water, with or without water recirculation (with or without recovery of methane emissions from discharge).	In case of the project activity, captured biogas will be treated and utilized directly for electricity generations.	Not relevant.
10	New facilities (Greenfield projects) and project activities involving a change of equipment resulting in a capacity addition of the wastewater or sludge treatment system compared to the designed capacity of the baseline treatment system are only eligible to apply this methodology if they comply with the relevant requirements in the "General guidelines to SSC CDM methodologies". In addition the requirements for demonstrating the remaining lifetime of the equipment replaced, as described in the general guidelines shall be followed.	The project activity is not a Greenfield project and does not involve a change of equipment resulting in a capacity addition.	Not relevant.

11	For project activities covered under paragraph 3 (b) and (c), additional guidance provided in Annex I (Methodology AMS.III.H version 15) shall be followed for the calculations, in addition to the procedures in the relevant sections in AMS.III version 15.	Only 3 (a) is applicable for the project activity as describe in 3.	Not relevant.
12	The location of the wastewater treatment plant as well as the source generating the wastewater shall be uniquely defined and described in the PDD.	The location of the two wastewater treatment plants are uniquely defined in the factory site of Zhejiang Jingxing Paper Joint Stock Co. Ltd. The source generating the wastewater is from the paper production in paper mill workshops, and the wastewater is being imported to the wastewater treatment plants through channels.	Applicable.
13	Measures are limited to those that result in aggeagate emissions reductions of less than or equal to 60kt CO2 equivalent annually from all Type III components of the project activity.	The implementation of the project (methane recovery part) activity will lead to an emission reduction of 52,185tCO2e/a, which is applicable for the SSC methodology as the annual emission reduction is obviously less than 60kt CO2 equivalent.	Applicable.

AMS-I.F (Version 01) is applicable to the **electricity generation component** of the project activity as showed in the following table.

Table B.2 Applicability check (electricity generation component)

No.	Technology/measure	In the case of the project activity	Applicability
1	This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to user(s). The project activity will displace electricity from an electricity distribution system that is or would have been	The project activity involves the installations of an electricity generation system by using the resource of biogas (a	Applicable (a).

	supplied by at least one fossil fuel fired generating unit i.e. in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below: (a) A national or a regional grid (grid hereafter); (b) Fossil fuel fired captive power plant; (c) A carbon intensive mini-grid.	type of renewable biomass). And the electricity will be fully consumed on site by the wastewater treatment plants. In the absence of the project activity, the users would have been supplied electricity from East China Power Grid that is supported mostly by fossil fuel power plants in that regional area. The facts described above are in line with the methodology AMS.I.F version 01 paragraph 1(a).	
2	For the purpose of this methodology, a mini-grid is defined as small-scale power system with a total capacity not exceeding 15 MW (i.e. the sum of installed capacities of all generators connected to the mini-grid is equal to or less than 15 MW) which is not connected to a national or a regional grid.	There is no mini-grid was introduced in the project activity. Without the project activity, all electricity consumed by the plant has to be imported from the national gird.	Not relevant.
3	Project activities or project activity component supplying electricity to a grid shall apply AMS.I.D, Project activities for standalone off-the-grid power systems supplying electricity to households/users included in the boundary are eligible under AMS.I.A.	The electricity produced from the project activity will be fully consumed on site by the wastewater treatment plants not to a grid.	Not relevant.
4	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m2; • The project activity results in new reservoirs	The project activity only involves the use of biogas for electricity generation.	Not relevant.

	and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.		
5	For biomass power plants, no other biomass other than renewable biomass are to be used in the project plant.	Only biogas captured from the anaerobic wastewater treatment system is being used in the electricity generation system, and no other biomass will be used in the project.	Applicable
6	This methodology is applicable for project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition, (c) Involve a retrofit of (an) existing plant(s); or (d) Involve a replacement of (an) existing plant(s).	New power plant at a site will be constructed and there was no renewable energy power plant operating prior to the implementation of the project activity.	Applicable
7	In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct[5] from the existing units.	New power plant at a site will be constructed and there was no renewable energy power plant operating prior to the implementation of the project activity.	Not relevant.
8	In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	New power plant at a site will be constructed and there was no renewable energy power plant operating prior to the implementation of the project activity.	Not relevant.
9	If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	New power plant at a site will be constructed and there was no renewable energy power plant operating prior to the implementation of the project activity.	Not relevant.
10	Combined heat and power (co-generation) systems are not eligible under this category.	The project activity does not involve a combined heat and power plant. Only	Not relevant.

		electricity power plant is applied.	
11	In case electricity produced by the project activity is delivered to another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the electricity will have to be entered into specifying that only the facility generating the electricity can claim emission reductions from the electricity displaced.	The electricity produced from the project activity will be fully consumed on site in the wastewater treatment plant.	Not relevant.

B.3. Description of the project boundary:

The spatial extent of the project boundary is defined as the physical, geographical site where the wastewater and sludge treatment takes place (including all equipments for biogas use or flaring). The project activity is only involving a biogas capture and utilization system without doing any changes to the existing wastewater treatment and sludge treatment system. The wastewater treatment plant will be operated continuously under the same quality of feed inflow, COD content, retention time, and temperature as in the baseline scenario, regardless the construction and operation of the project activity. Sludge from the wastewater treatment plant has been and will continue to be disposed at a controlled landfill. Both the wastewater treatment and sludge treatment system will not be affected by the project and emissions would remain the same in both baseline and project scenarios, therefore emissions from power consumption of the existing wastewater treatment plants and methane emissions from wastewater treatment do not have to be accounted for in the baseline and project emission calculations as per paragraph 15 AMS.III.H Version 15.

As per paragraph 12 AMS.I.F Version 01, the physical, geographical site of the renewable generation source delineate the project boundary. As explained under Section B.4 the baseline for the electricity generation component of the project activity is defined as the East China Power Grid as the electricity generated from the captured biogas will be consumed onsite and replace same amount of electricity imported from East China Power Grid. Therefore, all power plants connected physically to the East China Power Grid are also parts of project boundary. The reasons for defining the East China Power Grid as project boundary for the electricity generation component of the project activity are as follows:

1. In a country like China, with a layered dispatch system, grid boundary definitions shall be based on regional grids
2. The Project's electricity generation unit is connected to the Zhejiang Grid via local grid network, and thus finally to the East China Power Grid. The East China Power Grid is a large regional grid, which consists of five sub-grids: Shanghai Grid, Jiangsu Grid, Zhejiang Grid, Anhui Grid and Fujian Gird.
3. There is substantial inter-grid power exchange among the above-mentioned sub-grids of the East China Power Grid.
4. The East China Power Grid can be clearly identified as regional grid and information on the characteristics of this grid is publicly available.
5. There is guidance from the Chinese CDM Designated National Authority (National Climate Change Coordination Office) on project boundaries identifying the applicable grid as the project boundary.

Table B.3 Emission Sources in Baseline Scenario and Project Activity

	Source	Gas		Justification/Explanation
Baseline	Wastewater treatment	CH4	Included	The major source of emissions in the baseline from wastewater plant
		N2O	Excluded	Excluded for simplification. This is conservative.
		CO2	Excluded	CO2 emissions from the decomposition of organic waste are not accounted for
	Electricity consumption/ generation	CH4	Excluded	Excluded for simplification. This is conservative.
		N2O	Excluded	Excluded for simplification. This is conservative.
		CO2	Included	Electricity is generated with biogas from an anaerobic digester under the project activity; electricity generation from the grid is displaced by the project activity.
Project Activity	Wastewater treatment	CH4	Included	As the wastewater treatment plant remains unchanged, only installed methane emissions from flaring will be taken into account.
		N2O	Excluded	Not required by AMS.III.H
		CO2	Excluded	CO2 emissions from the decomposition of organic waste are not accounted for
	On-site electricity use	CH4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		CO2	Included	As the wastewater treatment plant remains unchanged, only electricity consumption from the new equipment installed due to the project activity will be taken into account as described in section B.3.
	On-site fossil fuel use	CH4	Excluded	Project will not cause additional fossil fuel consumption
		N2O	Excluded	Project will not cause additional fossil fuel consumption
		CO2	Excluded	Project will not cause additional fossil fuel consumption

Following Figure 3 shows a schematic diagram of the project boundary.

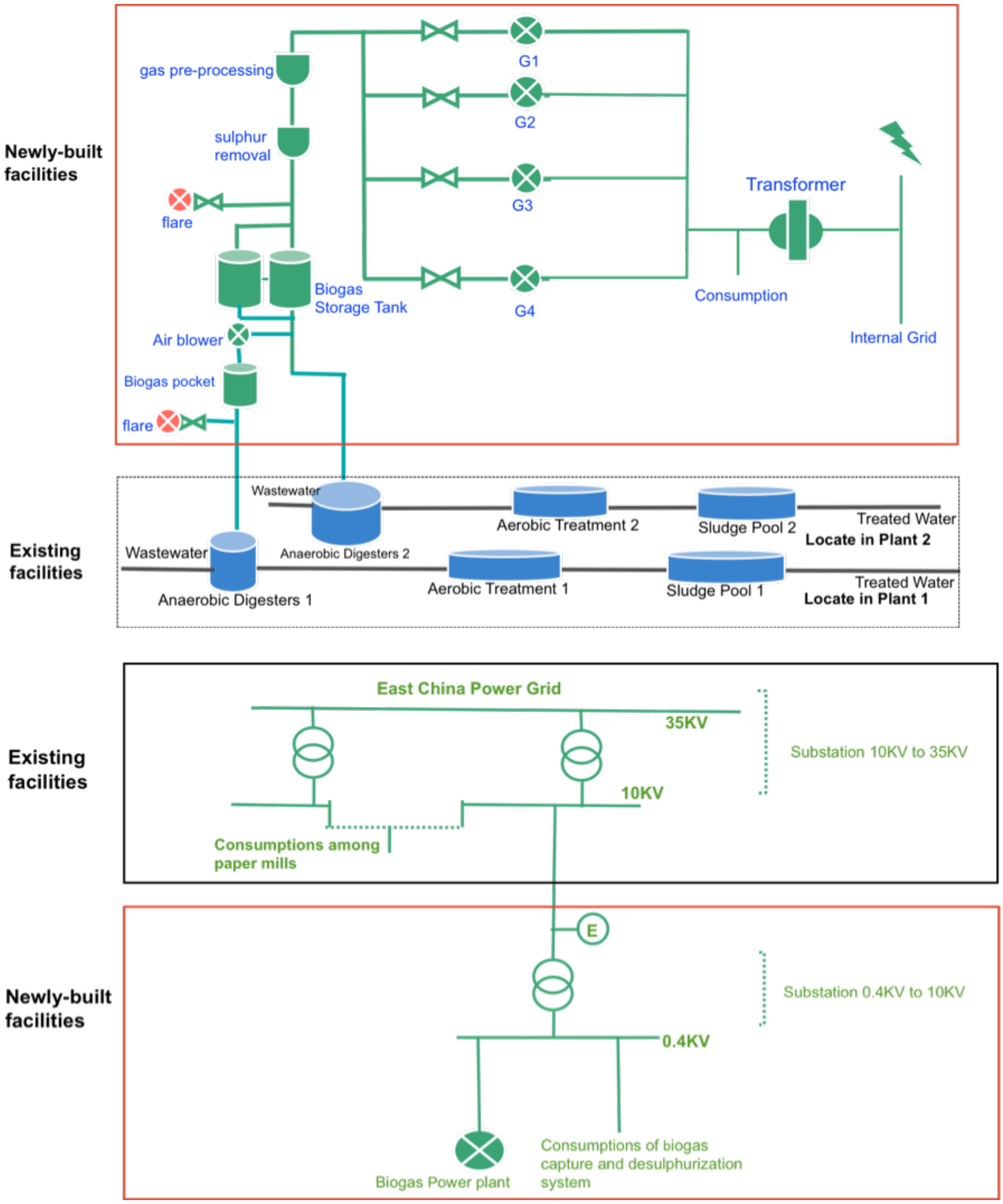

Figure 3. Project Boundary

B.4. Description of baseline and its development:

Prior to the construction of the project activity, biogas produced from the existing anaerobic systems will be released directly into the atmosphere. As no applicable laws and regulation mandates the utilization and destruction, continue to release the biogas to the atmosphere will be the mostly likely baseline scenario. Furthermore, utilizing the biogas without CDM revenues is not financial attractive according to the analysis in Section B.5. As per paragraph 18,19, AMS.III.H version 15, in determining baseline emissions, historical records of at least one year or a measurement campaign in the baseline wastewater systems for at least 10 days prior to the project implementation shall be used (include COD removal efficiency of the wastewater treatment system, volume of the waste water being treated in anaerobic digestion system, and all other parameters required for the determination of the baseline emissions). For this project activity, data records of a measurement campaign of 30 days will be provided and the average value will be applied in the calculations, and the result will be multiplied by 0.89 to account for the uncertainty range (30% to 50%) associated with this approach as compared to one-year historical data as per paragraph 15 AMS.III.H Version 15.

For the electricity generation component, baseline emissions will be the quantity of net electricity displaced as a result of the implementation of the CDM project activity multiplied by the emission factor of the grid as per AMS.I.F version01, paragraph 14.

According to the small-scale methodology I.D, the baseline emission factor is calculated as either the
A) “combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the “Tool to calculate the emission factor for an electricity system””, or the
B) “weighted average emissions (in kg CO_2/kWh of the current generation mix)”.

Power consumption in the East China Power Grid is growing rapidly, which requires the construction of additional generating capacity. The project activity is expected to replace electricity that would have otherwise been generated by plants at the operating margin. Therefore, the baseline emission factor has been calculated as the “combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the “Tool to calculate the emission factor for an electricity system”

As a result, the baseline scenario of the project can be described as follows: In the absence of the proposed biogas recovery and electricity generation system, biogas would continue to be directly released to the atmosphere and electricity would continue to be generated by the mix of power plants connected to the East China Power Grid as per AMS.III.H and AMS.I.F. Information regarding to the development of the baseline emissions will be elaborated in Section B.6.

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 small-scale CDM project activity:

Prior Consideration of CDM
The following table gives an overview of the project history. As per Annex 13 of EB62, the project start date is chosen as the first equipment purchasing contract date (13th December 2008) and notifications have been done to DNA and UNFCCC secretariat within six months of the project start date.

After the project start date, many actions were taken “to secure CDM status for the project in parallel with its implementation”. The table reports many events as contact with CDM consultants or negotiations with Swiss Carbon Assets Ltd. showing that the PO was actively and continuously looking for CDM services.

Table B.4 Brief history of the project development

Document	Date	Description
Feasibility Study Report (FSR)	08/2008	The FSR was completed by China CEC Engineering Co., Ltd with consideration of revenue from CDM.
Project approval	26/08/2008	The project received FSR approval from Economy and Trade Bureau of Pinghu City
Board decision of project with CDM	10/09/2008	Based on conclusion of the feasibility study, the project will be only viable with CDM revenues taken into account, board of Jingxing Paper Joint Stock Co., Ltd. decided to construct the biogas recovery for energy generation project and apply for CDM registration.
EIA	11/2008	The EIA study was completed
Environmental approval (EIA approval)	21/11/2008	The project received EIA approval from Environmental Protection Bureau of Pinghu City
Equipments purchasing contract	13/12/2008	Project start date: First purchasing contract with equipment integrator and suppliers signed in December 2008.
Construction started	04/02/2009	Construction contract was singed on 06/01/2009, and construction started on 04/02/2009.
Emission Reduction Purchase Agreement (ERPA)	01/05/2009	The project owner signed ERPA with Swiss Carbon Assets Ltd.
Project commissioning	23/06/2009	The project started commissioning at 23/06/2009, official operation started in October 2009.
CDM project notification (DNA)	09/06/2009	A notification was approved by DNA on 09/06/2009 with confirmation.
CDM project notification (UNFCCC)	09/06/2009	A notification was sent to UNFCCC with the confirmation of the receipt.

Additionally of the Project is demonstrated based on the requirement of Attachment A of Appendix B to the *Simplified Modalities and Procedures for Small-scale CDM Project Activities*. As per Attachment A of Appendix B, project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

a. Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;
b. Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;
c. Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
d. Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

Investment Barrier Analysis
This section is to demonstrate that a financially more viable alternative to the project activity would have led to higher emissions. Because the *Simplified Modalities and Procedures for Small-scale CDM Project.* The purpose of this part is to determine whether the project is economically attractive using an appropriate analysis method.

Determine appropriate analysis method

Three analysis methods are available: simple cost analysis, investment comparison analysis and benchmark analysis. According to the para 19 of the *"Guidelines on the Assessment of Investment Analysis" (version 05)*[6]*, the benchmark approach is suited to circumstances where the baseline does not require investment or is outside the direct control of the project developer*. As for the baseline scenario for the proposed project activity, i.e., the existing anaerobic wastewater treatment system without methane recovery and purchase of electricity from the ECPG, involves no investment, therefore benchmark analysis is applied to assess financial attractiveness of the proposed project activity. As per para 6 of the *"Guidelines on the Assessment of Investment Analysis" (version 05*), *the use of investment analysis to demonstrate additionality is intended to assess whether or not a reasonable investor would or not decide to proceed with a particular project activity without the benefits of the CDM.* As a result, the project internal rate of return (pre tax IRR) constitutes the financial indicator to look at when assessing the investment barrier. All input values were valid and applicable at the time of investment decision taken by the project participant.

Considering the project's electricity generation is 100% for captive use within the underlying industrial facility, and then the benchmark of the core business was considered to be appropriate for the investment decision on the project activity, which is line with EB guidance Annex 59 of EB 51[7]. And that is also the same benchmark as used for the decision making of the proposed project. According to *The Economic Assessment Method and Parameters for Construction Projects (version 03*)", IRR benchmark of pulp and paper industry is 13 % (project Pre-tax IRR). This book was published at August 2008 by the State planning Commission and Ministry of Construction in China and was widely used by the relevant authorities in China for assessing the financial viability of potential new projects, and it has been widely applied to the registered CDM projects of the same type, namely Ref.2647 and 2649. Therefore, the benchmark of the core business (13%) was applied for the project activity. This benchmark was also used by the board of directors in the scope of the investment decision meeting related to the proposed project.

Calculation and comparison of financial indicators:
The key figures and project IRR with and without revenue from CERs are listed in the following Table B.5. Without CERs revenue, the project IRR of the proposed project is only 6.0%, far lower than the benchmark IRR.

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[6]http://cdm.unfccc.int/filestorage/O/H/N/OHNFC4T6RUZEQXDL20JVG7MWK35YI1/eb62_repan5.pdf?t=R1N8MTMxMTA3MDk4Ni41%7CScHaELwHbSy7V0UnfPlwMVzrC3U=

[7] As per paragraph 10 to 11 of Annex 59 of EB 51 Report, for the projects of waste heat/waste gas for power generation, if more than 75% or more of the power output was meant to be consumed within the industry facilities, then the project can be defined as captive use and benchmark can defined according to the core business of the industries. The project activity has been identified as a captive power plant for the paper mill, 100% of its electricity is consumed within the project owner's facilities. The use of industrial benchmark for the project is consistent with the EB's guidance.

Table B.5. Basic parameters for calculation of the Project's IRR

Series	Item	Unit	Value	Source
	General description			
1	Installed capacity	MW	1.5	FSR[8] and Nameplate
2	Standby capacity	MW	0.5	FSR
3	Annual electricity net output	MWh/year	10,914	FSR
4	Project lifetime	Year	15	FSR
5	Electricity tariff excl. VAT	CNY/kWh	0.58	FSR, Electricity invoice
	Investment plan			
1	Total investment	Million CNY	37.6	FSR
2	Equity ratio	%	100%	FSR
	Revenue[9]			
1	Electricity savings	Million CNY	6.3301	
2	Sales of sulphur	Million CNY	0.101	Calculated from technical specifications of desulphurization system and sales receipt of sulphur
	Cost			
1	O&M Cost	Million CNY	2.4863	FSR
2	Depreciation period	Year	15	FSR
3	Rate of residual value	Million CNY	0	FSR
	Other			
1	CER price	EUR	8	ERPA
2	IRR Benchmark	%	13	Project IRR benchmark of pulp and paper industry

As per EB50 Annex 15, option (a) was applied in this project activity to determine the remaining lifetime of the baseline and project equipments. The manufacture's information on the technical lifetime of the equipments have been provided, and it proved that the technical lifetime for all equipments are 15 years (anaerobic reactors, biogas generators, desulphurization devices), and they are maintained according to the recommendations of equipment suppliers. As the first anaerobic reactor started commissioning at 2006, a conservative manner has been chosen for the determination of the remaining equipment lifetime (crediting period of 10 years has been chosen for ER calculations, and project lifetime of 15 years has been chosen for the calculation of project IRR).

As per paragraph 4 in ***Guidelines on the Assessment of Investment Analysis version05,*** the residual value (if there is residual value) of the project assets should be considered as cash inflow in the end of the assessment period. The fair value of the project activity should be calculated as per local accounting regulations. The biogas captured contains large amount of sulphur, and that makes the biogas highly

[9] There is no involvement of sludge/compost selling, and sludge treatment will remain the same as in the baseline scenario. Therefore, revenue of the project activity is only from electricity savings and sales of sulphur.

corrosive even treated by desulphurization system, therefore the engines will be corroded dramatically in the end. In line with FSR, with the average depreciation rate of 6.67%, the fixed assets will be depreciated completely, and the engines as well as other fixed assets will be useless at the end of the assessment period, therefore the residual value is "0". And this is also in line the Enforcement Regulations of Enterprise Income Tax Law of People's Republic of China Clause 59 and 60[10]. Residual value was also considered as "0" in the assessment of similar CDM registered project 2946.

If consider the residual value, 5% of the fixed assets investment, the IRR becomes to be 6.3%, which is slightly higher than the IRR without considering residual value 6.0%. So it is clear that the impact of residual value is considered to be limited for the assessment of this project.

Therefore, to be in line with the approved FSR, the assessment without considering the residual value is applied, and it is reasonable and acceptable based on the analysis above.

The residual value of "0" at the end of the assessment period as showed in TableB.5 is applied in the assessment of the project activity, and this is also in line with the clarifications of the Income Tax Law[11]. Furthermore, as per paragraph 5 of Guidelines on the Assessment of Investment Analysis version 05, pre-tax IRR has been chose for the assessment of this project activity, therefore taxation is not accounted in during the calculations of the project IRR. Also in line with paragraph 5 of ***Guidelines on the Assessment of Investment Analysis version05***, and the net profit for IRR calculations does not consider depreciation as a cost (cash outflow) as it is not an actual expense.

Using the values above in TableB.5, the IRR of the project activity is only 6.0% without consideration of CERs sales revenues, which is considered to be economically not attractive. While considering CERs revenue, the IRR will reach to 20.38%. Therefore, the Project faces severe investment barriers and fulfils the requirement of additionality.

Sensitivity Analysis

The tool for the demonstration and assessment of additionality requires that a sensitivity analysis is conducted to check whether, under reasonable variations in the critical assumptions, the results of the analysis remain unaltered. The revenue of the project activity is only from electricity savings and sales of sulphur. Therefore, electricity tariff and electricity generation are considered as important indicators for sensitivity analysis. As revenue from sales of sulphur only covered 1.4% of the total revenue, and also the conservative value (the highest value 101ton calculated from sulphur removed from desulphurization system) is applied for the IRR calculation. Therefore, the sale of sulphur is not considered for sensitivity analysis. Finally, together with total investment cost and O&M cost, the following fours parameters have been selected as sensitivity indicators to test the financial attractiveness for the proposed project:

- Electricity generation
- Electricity tariff
- Total Investment
- Operational and Maintenance Costs

[10] http://www.gov.cn/zwgk/2007-12/11/content_830645.htm

[11] http://www.chinatax.gov.cn/n8136506/n8136563/n8136874/n8137366/9742419.html

The results of the sensitivity analysis are shown in Figure 4 .

Variation Scope / IRR / Factor	-10%	-5%	0	5%	10%
Electricity generation	3.5%	4.8%	6.0%	7.2%	8.4%
Electricity tariff	3.5%	4.8%	6.0%	7.2%	8.4%
Total investment	7.7%	6.8%	6.0%	5.3%	4.6%
O&M cost	7.0%	6.5%	6.0%	5.6%	5.1%

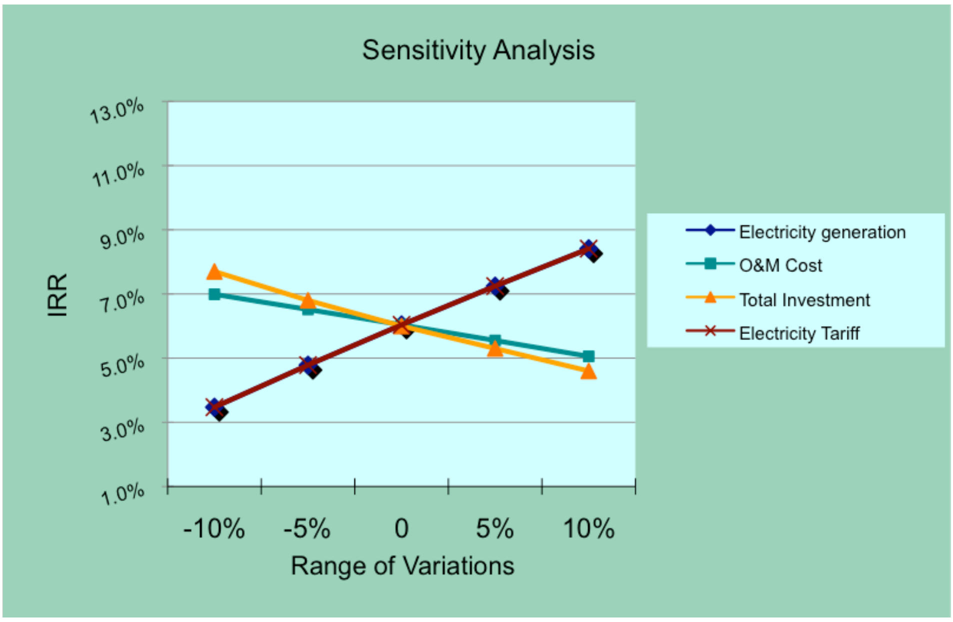


Figure 4 Sensitivity Analyses

As showed in Table Figure 4, variations of ±10% have been considered for the parameters. The figure shows when these four key parameters change within ±10%, IRR of the project is always lower than 13%. For the IRR to reach the benchmark, a drop of 34 % in the total investment, a rise of 31 % in the electricity tariff or an increase of 31% in the power generation or 80% decrease in O&M cost is required. Such fluctuations appear unlikely, as explained in Table B.6.

Table B.6. Critical point of variation when IRR reaches the benchmark

Sensitive Factor	Critical point of Variation to Reach the Benchmark	Practical Assessment
Total Investment	-34% (IRR 13.2%)	When the total investment of the project decreases, the project IRR increases. The total investment of the project is derived from page 22 of the FSR. And this total investment value was approved by the Economy Trade Bureau of Pinghu City(【2008】No.167). In addition, the sum of the current contracts equals 30.6million RMB. Each of these contracts was provided to the DOE. Price of Industrial products have been

		continuously increased during the last years. As a result, it is impossible for the total investment to drop by 34%.
Electricity Tariff	+31% (IRR13.0%)	According to the official statistic data issued by Development Reform Commission (DRC) of Zhejiang Province, the electricity price without VAT for industrial use is 0.519 Yuan/kWh[12] in 2008, and in 2009, the electricity price for industry use is 0.541Yuan/kWh [13]. Therefore, the annual average increasing rate of electricity price is around 4.2%. An increase of 31% is impossible.
Electricity Generation	+31%(IRR 13.0%)	Power generation estimation in FSR is based on 83% of plant load factor (page 2 of the FSR). An increase of 31% on electricity generation leads to an annual operation hour of 9888, which is impossible. Additionally, according to the technical manual of Zibo Diesel Engine New Energy Co., Ltd., gas engines with installed capacity of 1.5MW requires 16,200m^3 biogas per day. However, the daily biogas production of the project is only 15,000m^3. It is not feasible for the project to operate over capacity. Although the production of biogas will depend on the COD removal efficiency and the volume of wastewater treated, following evidences shows that no significant increase will be happened leading to a 31% increase on electricity generation: a). The volume of wastewater treated will depend on the operations of the paper mills. Till now, all the paper mills are running at full capacity (produce wastewater of 15000m^3) and the plant will not be enlarged due to the fact that paper is oversupplied in China[14]. a). The current COD removal efficiency is 75% (COD will be removed from 4000mg/l to 1000mg/l according to FSR), and the average COD removal efficiency of IC reactor is about 61% to 86%[15]. Even the COD removal efficiency increased to 86%, it only leads to an addition of biogas production of 1100m^3/d (IPCC default value, Methane correction factor is 0.25kg CH4/kg COD, methane density is 666.6g/m^3 at temperature of 20°C and 1 atmosphere), and that only leads to an increase of electricity generation of 903,375 kWh/year equals to an increase of 8% (as per the Technical Manual of Zibo Diesel Engine New Energy Co., Ltd., 1m^3 biogas can produce 2.25kWh electricity). Therefore, according to the above listed evidences, an increase

[12] http://www.zjpi.gov.cn/Resource/ContentShow/ItemHtml/2008-07/1487777542/313355091.html

[13] http://www.12398.gov.cn/html/information/14405899X/14405899X201000006.shtml

[14] http://www.cnnanhe.com/cn/shownews.asp?id=41

[15] http://img7.hbzhan.com/5/20100421/634074584365512500.pdf

		of 31% on power generations are very unlikely to be happened.
O&M cost	-80%(IRR 13.1%)	The project IRR is only 13.1 % when O&M costs decrease by 80%. And that will be not happened according to the normal inflation of the commodity price. Thus, the O&M costs have very limited impact on project IRR.

Conclusion of Additionality Analysis

The proposed project activity is additional due to its poor IRR without considering CDM revenue, which is far lower than the benchmark of 13%. Without carbon revenue, plant owner would rather choose to go on with current situation, under which biogas from wastewater plant is released into atmosphere directly and East China Power Grid supplies equivalent amount of electricity. This would lead to more greenhouse gas emissions than project activity.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Calculation of emission reductions of the project activity is in accordance with methodology of AMS III.H. Version 15. Here the project participants clarify that project activity of the proposed project falls under category (d) of the paragraph 1 of AMS.III.H. Version 15, say, introduction of biogas recovery and combustion to an existing anaerobic wastewater treatment system such as anaerobic reactor, lagoon, septic tank or an on site industrial plant. The emission reduction achieved by biogas electricity generation is estimated according to the AMS I.F (Version 01).

I) Emission reductions due to methane avoidance

I.1) The calculation of Baseline emissions

As explained under Section B.4, the baseline scenario for the methane avoidance component of the Project is the existing anaerobic wastewater treatment system without methane recovery and combustion (option (d) as per AMS.III.H). As per Paragraph 17 of AMS III.H Version 15, baseline emissions are calculated as follows:

$$BE_{methane,y} = \{BE_{power,y} + BE_{ww,treatment,y} + BE_{s,treatment,y} + BE_{ww,disch\arg e,y} + BE_{s,f\,inaly}\} \qquad \text{Equation (1)}$$

Where:

$BE_{methane,y}$ Baseline emissions due to methane avoidance in year *y* (tCO_2e)

$BE_{power,y}$ Baseline emissions from electricity or fuel consumption in year *y* (tCO_2e)

$BE_{ww,treatment,y}$ Baseline emissions of the wastewater treatment systems affected by the project activity in year *y* (tCO_2e)

$BE_{s,treatment,y}$ Baseline emissions of the sludge treatment systems affected by the project activity in year *y* (tCO_2e)

$BE_{ww,discharge,y}$ Baseline methane emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake in year *y* (tCO_2e).

$BE_{s,final,y}$ Baseline methane emissions from anaerobic decay of the final sludge produced in year *y* (tCO_2e). If the sludge is controlled combusted, disposed in a landfill with biogas recovery, or used for soil application in the baseline scenario, this term shall be neglected.

As per AMS.IIIH version 15, paragraph 15 and section B.3, $BE_{power,y}$, $BE_{ww,discharge,y}$ *and* will not be accounted for in baseline scenario, and relevant emissions will not be accounted for neither in the calculations of project emissions as it is defined to be not affected by the project activity. $BE_{s,treatment,y}$ and $BE_{s,final,y}$ will not be accounted neither as the sludge disposal remains unchanged both in the project scenario.

Therefore,

$BE_{methane,y} = BE_{ww,treatment,y}$ Equation (1.1)

According to paragraph 19 in AMS.III.H version 15, instead of applying the average data of one-year history record prior to the project implementations, an alternative method of a measurement campaign and a factor of 0.89 will be applied for the calculations of baseline and project emissions of the project activity as described in Section B.4. As per paragraph 21, in AMS.III.H version 15, methane emissions from the baseline wastewater treatment systems affected by the project activity ($BE_{ww,treatment,y}$) are determined using the methane generation potential of the waste water treatment systems:

$$BE_{ww,treatment,y} = \sum_i Q_{ww,i,y} * COD_{removed,i,y} * MCF_{ww,treatment,BL,i} * B_{o,ww} * UF_{BL} * GWP_{CH4} \quad \text{Equation (1.2)}$$

Where:

$Q_{ww,i,y}$	Volume of wastewater treated in baseline wastewater treatment system *i* in year *y* (m^3)
$COD_{removed,i,y}$	Chemical oxygen demand removed by baseline treatment system *i* in year *y* ($tonnes/m^3$), measured as the difference between inflow COD and the outflow COD in system *i*
$MCF_{ww,treatment,BL,i}$	Methane correction factor for baseline wastewater treatment systems *i* (MCF value for Anaerobic reactor without methane recovery is 0.8 as per table III.H.1)
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC value of 0.25 kg CH_4/kg COD)
UF_{BL}	Model correction factor to account for model uncertainties (0.89)
GWP_{CH4}	Global Warming Potential for methane (value of 21)

I.2) The calculation of project emissions

The project activity emissions due to methane avoidance are calculated as follows (Paragraph 27 of ASM III.H Version 15):

$$PE_{methane,y} = \langle PE_{power,y} + PE_{ww,treatment,y} + PE_{s,treatment,y} + PE_{ww,discharge,y} + PE_{s,final,y} + PE_{fugitive,y} + PE_{biomass,y} + PE_{flaring,y} \rangle \quad \text{Equation (2)}$$

Where:

$PE_{methane,y}$	Project activity emissions due to methane avoidance in the year "*y*" (tCO_2e)
$PE_{power,y}$	Emissions from electricity or fuel consumption in the year *y* (tCO_2e). These emissions shall be calculated as per paragraph 20, for the situation of the project scenario, using energy consumption data of all equipment/devices used in the project activity wastewater and sludge treatment systems and systems for biogas recovery and flaring/gainful use.
$PE_{ww,treatment,y}$	Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery, in year *y* (tCO_2e). These emissions shall be calculated as per equation 2 in paragraph 21, using an uncertainty factor of 1.12 and data applicable to the project situation. ($MCF_{ww,,treatment,,PJ,k,}$ and $COD_{,removed,,PJ,,k,}$) and with the following changed definition of parameters;
$MCF_{ww,,treatment,,PJ,k,}$	Methane correction factor for project wastewater treatment system *k* ((MCF values as per Table .III..H.)
$COD_{,removed,,PJ,,k,,y}$	Chemical oxygen demand removed by project wastewater treatment system *k* in year *y* ((t/m^3) measured as the difference between inflow COD and the outflow COD in system *k*
$PE_{s,treatment,y}$	Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery, in year *y* (tCO_2e).
$PE_{ww,discharge,y}$	Methane emissions from degradable organic carbon in treated wastewater in year *y* (tCO_2e).
$PE_{s,final,y}$	Methane emissions from anaerobic decay of the final sludge produced in year *y* (tCO_2e).

$PE_{fugitivie,y}$ Methane emissions from biogas release in capture systems in year *y*, calculated as per paragraph 28 (tCO_2e)

$PE_{biomass,y}$ Methane emissions from biomass stored under anaerobic conditions. In case storage of biomass under anaerobic conditions takes place due to the project activity that doesn't occur in the baseline situation, methane emissions due to anaerobic decay of this biomass shall be considered and be determined as per the procedure in the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site" (tCO_2e)

$PE_{flaring,y}$ Methane emissions due to incomplete flaring in year *y* as per the "Tool to determine project emissions from flaring gases containing methane"(tCOe)

As described in Section B.3 and Section B.6.1, wastewater treatment plant remains unchanged regardless of the construction and implementation of the project activity. Therefore, *emissions from fuel consumptions of existing wastewater treatment system and* $PE_{ww,treatment,y}$ will not be accounted for as they were defined unaffected by the project activity. And only electricity consumption from the new devices installed will be taken into account. Additionally, $\boldsymbol{PE_{s,treatment,y}}$ and $\boldsymbol{PE_{s,final,y}}$ were also defined as unaffected by the project activity as the sludge disposal remains unchanged in the project scenario, and emissions both in baseline scenario and project activity will not be accounted as they will have the same amount of emissions (please also refer to the analysis in section B.3 and B.6.1).The same logic will also be applied for $\boldsymbol{PE_{ww,discharge,y}}$ as no changes were happened for the existing wastewater treatment system.

$\boldsymbol{PE_{biomass,y}}$ are all not applicable for the project activity as no biomass will stored under anaerobic conditions.

Hence,

$$PE_{methane,y} = PE_{fugitivie,y} + PE_{flaring,y} \qquad \text{Equation (2.1)}$$

a) $PE_{fugitive,y}$

$PE_{fugitive,y}$ Methane emissions from biogas release in capture systems in year *y*, calculated as per paragraph 28 (tCO_2e)

$$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y} \qquad \text{Equation (2.2)}$$

Where:

$PE_{fugitive,ww,y}$ Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment in year "y" (tCO2e);

$PE_{fugitive,s,y}$ Fugitive emissions through capture inefficiencies in the anaerobic sludge treatment in the year "y" (tCO2e)

Fugitive emissions through capture inefficiencies in the anaerobic sludge treatment in the year "y" is not applicable because the project activity does not comprise an anaerobic treatment system for sludge and the construction and implementation of the project didn't affect the sludge disposal. Hence, the term $PE_{fugitive,s,y}$ will not be accounted.

The first term of the equation above is calculated as follows:

$$PE_{fugitive,ww,y} = (1 - CFE_{ww}) \cdot MEP_{ww,treatment,y} \cdot GWP_{CH4} \qquad \text{Equation (2.2.1)}$$

Where:

CFE_{ww} Capture efficiency of the biogas recovery equipment in the wastewater treatment systems (a default value of 0.9 shall be used)
GWP_{CH4} Global Warming Potential for methane (value of 21 is used)
$MEP_{ww,treatment,y}$ Methane emission potential of wastewater treatment systems equipped with biogas recovery system in year *y* (tonnes) which is calculated according to the equation below:

$$MEP_{ww,treatment,y} = Q_{ww,y} * B_{o,ww} * UF_{PJ} * \sum_{k} COD_{removed,PJ,k,y} \cdot MCF_{ww,treatment,PJ,k} \qquad (2.2.2)$$

Where:
$Q_{ww,y}$ Volume of wastewater treated in the year y (m)
$B_{o,ww}$ Methane producing capacity of the wastewater (IPCC default value for domestic wastewater of 0.25kg CH4/kg COD)
$COD_{removed,PJ,k,y}$ The chemical oxygen demand removed by the treatment system *k* of the project activity equipped with biogas recovery in the year *y* (tonnes/m3)
$MCF_{ww,treatment,PJ,k,y}$ Methane correction factor for the project wastewater treatment system *k* equipped with biogas recovery equipment (MCF value for Anaerobic reactor without methane recovery is 0.8 as per table III.H.)
UF_{PJ} Model correction factor to account for model uncertainties (1.12)

As described in Section B.3, and as per paragraph 15, AMS.III.H version 15, the treatment system (reactors) that will be covered and/or equipped with biogas recovery by the project activity, but continue to operate with the same quality of feed inflow, volume and temperature as in the baseline scenario, may be considered as not affected and the methane generation potential remains unchanged. Therefore, the same data will be applied here as in the calculations of baseline situation. The data in the measurement campaign (please also refer to Section B.4) the will be applied here.

b) $PE_{flaring,y}$

Methane emissions due to incomplete flaring in year y are calculated as per the "Tool to determine project emissions from flaring gases containing methane" (tCO_2e). The project owner has installed open flaring system. For the determination of the flare efficiency, the default value of 50% will be used for the calculation of project emissions from flaring gases. According to the description in the *"Tool to determine Project emissions from flaring gases containing methane"* the Project emissions from flaring gases are calculated as follows:

$$PE_{flare,y} = \sum_{i-l}^{8760} TM_{RG,h} * (1-\eta_{flare,h}) * \frac{GWP_{CH_4}}{1000} \qquad \text{Equation 2.3}$$

Where:
$PE_{flare,y}$: Project emissions from flaring of the residual gas stream in a year *y*; tCO_2e
$TM_{RG,h}$ Mass flow rate of methane in the residual gas in the hour *h*; kg/h
$\eta_{flare,}$ Flare efficiency in hour *h;* h

The mass flow rate of methane in the residual gas is calculated as follows:

$$TM_{RG,h} = FV_{RG,h} * fv_{CH_4,RG,h} * p_{CH_4,n} \qquad \text{Equation 2.3.1}$$

Where:

$TM_{RG,h}$ Mass flow rate of methane in the residual gas in the hour *h*; kg/h

$FV_{RG,h}$ Volumetric flow rate of the residual gas in dry basis at normal conditions in hour *h;* Nm^3/h
$fv_{CH4,RG,h}$ Volumetric fraction of methane in the residual gas on dry basis in hour *h*;
$\rho_{CH4,n}$ Density of methane at normal conditions (0.7168 Kg/Nm^3)

I.3) Leakage

As per AMS.III.H leakage effects do not have to be considered since the used technology equipment is not being transferred from or to another activity. The proposed project activity does not involve upgrading and bottling of biogas and no leakage will happen from this part either, hence:

$$Leakage_y = 0$$ Equation (3)

I.4) Emission reductions due to methane avoidance

The emission reductions related to methane avoidance in the wastewater treatment process are calculated as the difference between the baseline emissions (Section 1.b above) and the sum of the project emissions (Section 1.a) and leakage (Section 1.c):

$$ER_{methane,y,exante} = BE_{methane,y,exante} - (PE_{methane,y,exante} + LE_{mehane,y,exante})$$ Equation (4)

Where:
$ER_{y,ex\ ante}$ *Ex ante* emission reduction in year *y* due to the methane avoidance (tCO_2e)
$LE_{y,ex\ ante}$ *Ex ante* leakage emissions in year *y* due to methane avoidance (tCO_2e)
$PE_{y,ex\ ante}$ *Ex ante* project emissions in year *y* due to methane avoidance (tCO_2e)
$BE_{y,ex\ ante}$ *Ex ante* baseline emissions in year *y* due to methane avoidance (tCO_2e)

In accordance with the paragraph 32 of AMS III.H, emission reductions from the methane recovery component is limited to the *ex post* calculated baseline emissions minus project emissions using the actual monitored data for the project activity.
It is possible that the project activity involves wastewater an sludge treatment systems with higher methane conversion factors ((MCF)) or with higher efficiency than the treatment systems used in the baseline situation. .The emission reductions achieved in any year are the lowest value of the following:

$$ER_{y,ex:post} = \min(BE_{mathane,y,ex:post} - PE_{methane,y,ex:post} - LE_{methane,y,ex:post}), (MD_{methane,y} - PE_{methane,y,ex:post} - LE_{methane,y,ex:post})$$ Equation (4.1)

Where:
$ER_{y,ex\ post}$ Emission reductions achieved by methane avoidance based on monitored values for year *y* (tCO_2e)
$BE_{y,ex\ post}$ Baseline emissions due to methane avoidance calculated as per paragraph 16 using *ex post* monitored values (tCO_2e)
$PE_{y,ex\ post}$ Project emissions due to methane avoidance calculated as per paragraph 26 using *ex post* monitored values (tCO_2e)
$MD_{methane,y}$ Methane captured and destroyed/gainfully due to methane avoidance in the year *y* (tCO_2e)

$$MD_{methane,y} = BG_{burnt,y} * W_{CH4} * D_{CH_4} * FE * GWP_{CH_4}$$ Equation (4.1.1)

Where:

$BG_{burnt,y}$	Biogas flared/combusted in year *y* (m^3)
$w_{CH4,y}$	Methane content[12] in the biogas in the year *y* (volume fraction)
D_{CH4}	Density of methane at the temperature and pressure of the biogas in the year *y* (tonnes/m^3)
FE	Flare efficiency in year *y* (fraction)

II) Emission reductions due to electricity displacement

As per AMS.I.F version 01,

$ER_y = BE_y - PE_y - Lekage_y$ Equation (5)

Where:

ER_y	Emission reductions in year "y", tCO2e
BE_y	Baseline emissions in year "y", tCO2e
PE_y	Project emissions in year "y", tCO2e
$Leakage_y$	Leakage emissions in year "y", tCO2e

Project emissions will not accounted for here as EG_y refers to net electricity supplied. According to AMS-I.F Version 01, because there is neither energy generating equipment transferred from another activity nor existing equipment transferred to another activity, so no leakage calculation is required for the proposed project activity.

Hence,
$ER_y = BE_y$

As per AMS I.F version 01 paragraph 14: Baseline emissions for other systems are the product of amount electricity displaced with the electricity produced by the renewable generating unit and an emission factor:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system'.
OR
(b) The weighted average emissions (in kg CO2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

The option (a) has been used which prescribes use of "Tool to calculate the emission factor for an electricity system." Furthermore,

$$BE_y = ER_y = EG_{BL,y} * EF_{CO2,y}$$ Equation (5.1)

Where:

$EG_{BL,y}$	Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{CO2,y}$	Emission factor (tCO2/MWh)

At this point, it is important to clarify the nature of electricity replaced by the project activity. The biogas plant is connected to the company internal grid and replaces therefore electricity from the East China power grid as the electricity demand of the wastewater treatment plant will be met by East China Power Grid without the project activity.

a) Calculation of Baseline Emission Factor from the East China Power grid

The baseline emission factor is calculated according to method (a) selected from the methodology AMS-I.F (Version 01) as the Combined Margin (CM): the equally weighted average of the Operating Margin (OM) emission factor ($EF_{OM,y}$) and the Build Margin (BM) emission factor ($EF_{BM,y}$). Combined, Operating and Build Margin emission factors are calculated according to the procedures prescribed in the *"Tool to calculate the emission factor for an electricity system"* (Version 2). The detailed calculation approach and the applied formulae are provided in this section, whereas all calculation tables and parameters are listed in Annex 3.

Step 1. Identify the relevant electricity systems

As per delineation of Chinese national electric system published by *National Development and Reform Commission*, which is also Chinese DNA, the relevant electric power system is *East China Power Grid*. The Project's electricity generation unit is connected to the *company's internal* and consumed totally on site replacing same amount of electricity imported from East China Power Grid. The *East China Power Grid* is a large regional grid, which consists of four sub-grids: *Shanghai Grid, Zhejiang Grid, Jiangsu Grid, Anhui Grid* and *Fujian Grid*. There is substantial inter-grid power exchange among the above-mentioned sub-grids of the *East China Power Grid*. The *East China Power Grid* can be clearly identified as regional grid and information on the characteristics of this grid is publicly available. [16]

For ECPG, there are electricity imports from Central China Power Grid (CCPG) and Yangcheng Power Plant, therefore the connected electricity system is defined as CCPG and Yangcheng Power Plant. When determining the operating margin (OM) emission factor of ECPG, the PDD uses the weighted average operating margin emission rate of CCPG and Yangcheng Power Plant respectively as the emission factor of net electricity imports from CCPG and Yangcheng Power Plant to ECPG, and the data used for calculation is adopted from the most recent 3 years.

,
For the purpose of determining the operating margin emission factor, use the simple operating margin emission rate of the exporting grid, determined as described in step 3 (a) to determine the CO_2 emission factor(s) for net electricity imports ($EF_{grid,import,y}$) from a connected electricity system within the same host country(ies).

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

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:
Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

[16] National Development and Reform Commission of China published delineation of the electricity grid of China. Please visit http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2552.pdf for more details.

The project chooses only to include the grid power plants in the calculation (Option I), as information of the off-grid power plants is not completely publicly accessible.

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

"Tool to calculate the emission factor for an electricity system" (Version 02) outlines four options for the calculation of the Operating Margin emission factor(s) ($EF_{grid,OM,y}$):

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM.

As per *"Tool to calculate the emission factor for an electricity system"* (Version 2), any of the four methods can be used. "Dispatch Data Analysis" method is not selected herein, because dispatch data, let alone detailed dispatch data, are not available to the public or to the project participants. For the same reason, the simple adjusted OM methodology cannot be used.

The Simple OM method has been chosen instead. This is possible because low cost/ must run resources account for less than 50% of the power generation in the grid in most recent years. From 2004 to 2008, according to gross annual power generation statistics for the East China Power Grid, the ratio of power generated by hydro-power and other low cost/compulsory resources was: 9.77% in 2004, 11.65% in 2005, 11.43% in 2006,10.92% in 2007 and 12.3% in 2008 respectively, significantly lower than 50%.[17]

The simple OM of the grid for the proposed project is calculated using the Ex ante option: If the *ex ante* option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation.

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

The simple Operating Margin (OM) emission factor ($EF_{grid,OMsimple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants. As per *"Tool to calculate the emission factor for an electricity system"* (Version 2.0), it may be calculated:

Option A: Based on the net electricity generation and a CO2 emission factor of each power unit; or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B can only be used if:

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

[17] *China Energy Year Book, 2005-2009*

(c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

Since neither the data of fuel consumption nor the net electricity generation for every single electricity generation plant/unit is publicly available for *East China Power Grid*, nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known and off-grid power plants are not included in the calculation, the proposed project uses Option B for simple OM calculation.

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

Under this option, 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:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \qquad \text{Equation (5.2)}$$

Where:

$EF_{grid,OMsimple,y}$	Simple operating margin CO2 emission factor in year *y* (tCO2/MWh)
$FC_{i,y}$	Amount of fossil fuel type *i* consumed by project electricity system in year *y* (mass or volume unit)
$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit)
$EF_{CO2,i,y}$	CO2 emission factor of fossil fuel type *i* in year *y* (tCO2/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 plant / unit m in year y
y	The relevant year as per the data vintage chosen in Step 3

The Operating Margin emission factors for 2006, 2007 and 2008 are calculated separately and then the three-year average is calculated as a full-generation-weighted average of the emission factors. For details please refer to Annex 3. The result of the Operation Margin Emission Factor calculation is 0.8592 tCO_2e/MWh.

The operating margin emission factor of the baseline is calculated as a fixed ex-ante value and will not be renewed within the first crediting period of the project activity.

Step 5. Identify the group of power units to be included in the build margin

As per the emission factor tool, 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.

However, in China it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that were built most recently. Taking notice of this situation, EB accepts[18] the following deviation in methodology application:

1) Capacity addition from one year to another is used as basis for determining the build margin, i.e. the capacity addition over 1 - 3 years, whichever results in a capacity addition that is closest to 20% of total installed capacity.

2) Proportional weights that correlate to the distribution of installed capacity in place during the selected period above are applied, using plant efficiencies and emission factors of commercially available best practice technology in terms of efficiency. It is suggested to use the efficiency levels of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

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

Option 1. For the first crediting period, calculate the build margin emission factor 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.

Option 2. For the first crediting period, the build margin emission factor shall be updated annually, ex- post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Project participants have chosen *Option 1* for BM calculation.

Step 6. Calculate the build margin emission factor

As per the method of Chinese NDRC accepted by EB, since there is no way to separate the different generation technology capacities based on coal, oil or gas fuel etc from the generic term "thermal power" in the present energy statistics, the following calculation measures will be taken:

First, according to the energy statistics of the selected period in which approximately 20% capacity has been added to the grid, determine the ratio of CO_2 emissions produced by solid, liquid, and gas fuel consumption for power generation; than multiply this ratio by the respective emission factors based on commercially available best practice technology in terms of efficiency. Finally, this emission factor for

[18] This is in accordance with the "„Request for guidance: Application of AM0005 and AMS-I.D in China", a letter from DNV to the Executive Board, dated 07/10/2005, available online at: http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM.
This approach has been applied by several registered CDM projects so far.

thermal power is multiplied with the ratio of thermal power identified within the approximation for the latest 20% installed capacity addition to the grid. The result is the BM emission factor of the grid.

Sub-step 1
Calculate the proportion of CO_2 emissions related to consumption of coal, oil and gas fuel used for power generation as compared to total CO_2 emissions from the total fossil fuelled electricity generation (sum of CO_2 emissions from coal, oil and gas).

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \cdot * NCV_{i,y} * EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} * NCV_{i,j} * EF_{CO2,i,j,y}}$$ Equation (5.2.2)

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \cdot * NCV_{i,y} * EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} * NCV_{i,j} * EF_{CO2,i,j,y}}$$ Equation (5.2.3)

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \cdot * NCV_{i,y} * EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} * NCV_{i,j} * EF_{CO2,i,j,y}}$$ Equation (5.2.4)

Where,
$F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed b province j in year(s) y,
$EF_{CO_{2,i,j}}$ is the CO_2 emission factor of fossil fuel type i consumed by province j
$NCV_{i,j}$ Net calorific value (energy content) of fossil fuel type *i* consumed by province *j* (GJ / mass or volume unit).

Coal, Oil and *Gas* stands for solid, liquid and gas fuels respectively.

Sub-step 2: Calculate the operating margin emission factor of fuel-based generation.
$$EF_{Thermal} = \lambda_{Coal} \cdot EF_{Coal,Adv} + \lambda_{Oil} \cdot EF_{Oil,Adv} + \lambda_{Gas} \cdot EF_{Gas,Adv}$$ Equation(5.2.5)
Where,
$EF_{Thermal}$ is the weighted emissions factor of thermal power generation with the efficiency level of the best commercially available technology in China in the previous three years.
$EF_{Coal,Adv}, EF_{Oil,Adv}, EF_{Gas,Adv}$ are the emission factors of coal, oil and gas-fired power generation with efficiency levels of the best commercially available technology in China in the previous three years.

A coal-fired power plant with a total installed capacity of 600 MW is assumed to be the best commercially available technology in terms of efficiency, the estimated coal consumption of such a National Sub-critical Power Station with a capacity of 600MW is 314.35 gce/kWh, which corresponds to an efficiency of 39.08% for electricity generation.

For gas and oil power plants a 200MW power plant with a specific fuel consumption of 238.74gce/kWh, which corresponds to an efficiency of 51.46% for electricity generation, is selected as the best commercially available technology in terms of efficiency.

The main parameters used for calculation of the thermal power plant emission factors $EF_{Coal,Adv}$, $EF_{Oil,Adv}$, $EF_{Gas,Adv}$ are provided in Annex III.

Sub-step 3: Calculate the Build Margin emission factor

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \cdot EF_{Thermal} \quad \text{Equation(5.2.6)}$$

Where,

CAP_{Total} is the total capacity addition of the selected period in which approximately 20% capacity has been added to the grid,

$CAP_{Thermal}$ is the total thermal power capacity addition of the selected period in which approximately 20% capacity has been added to the grid.

Detailed calculations are provided in Annex 3.
The result of the Build Margin emission factor calculation is 0.6789 tCO_2e/MWh.
As mentioned above, the build margin emission factor of the baseline is calculated as a fixed ex-ante value and will not be renewed within the first crediting period.
The data sources for calculating OM and BM are:

1. Installed capacity, power generation and the rate of internal electricity consumption of thermal power plants for the years 2006 to 2008
   Source: *China Electric Power Yearbook* (2007-2009)
2. Fuel consumption and the net caloric value of thermal power plants the years 2006 to 2008
   Source: *China Energy Statistics Yearbook* (figures are for 2007-2009)
3. Carbon emission factor and carbon oxidation factor of each fuel
   Source: *Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook*, P1.23 and P1.24 in Chapter one.

Step 7. Calculate the combined margin emissions factor

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

$$EF_{grid,CM,y} = w_{OM} \cdot EF_{grid,OM,y} + w_{BM} \cdot EF_{grid,BM,y} \quad \text{Equation(5.2.7)}$$

The operating margin emission factor ($EF_{grid,OM,y}$) of East China Power Grid is 0.8592 tCO_2e/MWh and the build margin emission factor ($EF_{grid,BM,y}$) is 0.6789 tCO_2e/MWh. The defaults weights are used as specified in the emission factor tool: $w_{OM} = 0.5$; $w_{BM} = 0.5$

The result of the Baseline Emission Factor (EF_y) calculation is 0.7690 tCO_2e/MWh.

III. Total emission reductions

Overall,

$$\mathbf{ER_{total,y}=ER_{methane,y}+ER_{electricity,y}} \quad \text{Equation(6)}$$

Where:

$ER_{total,y}$	total emission reductions in year "y', tCO2e
$ER_{methane,y}$	emission reductions due to methane avoidance in year "y", tCO2e
$ER_{electricity,y}$	emission reductions due to electricity displacement in year "y", tCO2e

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

Data / Parameter:	$B_{o,ww}$
Data unit:	kg CH_4/kg COD
Description:	methane producing capacity of the wastewater
Source of data used:	Methodology's default value
Value applied:	0.25 kg CH_4/kg COD
Justification of the choice of data or description of measurement methods and procedures actually applied :	Methodology's default value using conservative correction factor
Any comment:	As per AMS.III.H Version 12, the IPCC default value of 0.25 kg CH4/kg COD was corrected to take into account the uncertainties.

Data / Parameter:	GWP_{CH4}
Data unit:	-
Description:	Global Warming Potential for methane
Source of data used:	IPCC: Climate Change 1995, The Science of Climate Change: Summary for Policymakers and Technical Summary of the Working Group I Report, pg. 26
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	Standard value recommended by UNFCCC
Any comment:	

Data / Parameter:	***MCF***
Data unit:	Fraction
Description:	methane correction factor for the wastewater treatment system
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories (Volume 5, Chapter 6), value for anaerobic reactors
Value applied:	$MCF_{ww,treatment,PJ,k,y} = 0.8$ (for calculation of project emissions) $MCF_{ww,treatment,BL}$ =0.8 (for calculation of baseline emissions)
Justification of the choice of data or description of measurement methods and procedures actually applied:	IPCC default value
Any comment:	As per AMS.III.H Version 15, the higher IPCC value is used for calculation of project emissions and the lower value for baseline emissions as a conservative measure.

Data / Parameter:	UF_{BL}

Data unit:	Factor
Description:	Model correction factor to account for model uncertainties
Source of data used:	AMS III.H/ Version 15
Value applied:	0.89
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the AMS III.H, Correction factor will be used for estimation of baseline emissions.
Any comment:	

Data / Parameter:	**UF_{PJ}**
Data unit:	Factor
Description:	Model correction factor to account for model uncertainties
Source of data used:	AMS III.H/ Version 15
Value applied:	1.12
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the AMS III.H, Correction factor will be used for estimation of project activity emissions.
Any comment:	

Data / Parameter:	$CFE_{ww,}$
Data unit:	Fraction
Description:	Capture efficiency of the biogas recovery equipment in the wastewater treatment systems
Source of data used:	AMS III.H Version 15
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value
Any comment:	

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO2/MWh
Description:	Combined margin CO2 emission factor of East China Power Grid in year *y*
Source of data used:	*China Electric Power Yearbook 2007-2009, China Energy Statistics Yearbook 2008, 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	0.7690
Justification of the choice of data or description of measurement methods and procedures actually applied:	Based on officially released statistics; publicly accessible and reliable data source with emission data for some fuels revised in compliance with IPCC 2006's default values.
Any comment:	Based on combined margin calculation of OM and BM of East China Power Grid. Weighting of OM and CM are both 50%. The proposed

	project uses fixed ex ante emission factor in the first crediting period. Detailed calculation is provided in Annex 3.

Data / Parameter:	$EF_{grid,OMsimple,y}$
Data unit:	tCO2/MWh
Description:	Simple operating margin CO2 emission factor of East China Power Grid in year *y*
Source of data used:	*China Electric Power Yearbook 2007-2009, China Energy Statistics Yearbook 2008, 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	0.8592
Justification of the choice of data or description of measurement methods and procedures actually applied :	Based on officially released statistics; publicly accessible and reliable data source with emission data for some fuels revised in compliance with IPCC 2006's default values.
Any comment:	The proposed project uses fixed ex ante emission factor in the first crediting period. Detailed calculation is provided in Annex 3.

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO2/MWh
Description:	Build margin of East China Power Grid in year *y*
Source of data used:	*China Electric Power Yearbook 2007-2009, China Energy Statistics Yearbook 2008, 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	0.6789
Justification of the choice of data or description of measurement methods and procedures actually applied :	Officially released statistics; publicly accessible and reliable data source
Any comment:	The proposed project used Chinese NDRC method to calculate BM emission factor. This alternative method was accepted by EB in registered projects from China. The proposed project uses fixed ex ante emission factor in the first crediting period. Detailed calculation is provided in Annex 3.

Data / Parameter:	$EG_{m,y}$
Data unit:	MWh
Description:	Electricity delivered to the grid by relevant power sources *m* in (years) *y* (2006-2008, East China Power Grid)
Source of data used:	*China Electric Power Yearbook 2007-2009*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Officially released statistics; publicly accessible and reliable data source
Any comment:	To calculate the OM and BM

Data / Parameter:	*Electricity Imports from Connected Electricity Systems to* East China Power Grid
Data unit:	MWh
Description:	Electricity Imports from Connected Electricity Systems to East China Power Grid in (years) y (2006-2008)
Source of data used:	*China Electric Power Yearbook 2007-2009*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Officially released statistics; publicly accessible and reliable data source
Any comment:	To calculate the OM

Data / Parameter:	$FC_{i,m,y}$
Data unit:	10^4t/10^8m^3
Description:	Amount of fuel *i* consumed by relevant power sources *m* in (years) *y* (2006-2008, East China Power Grid)
Source of data used:	*China Energy Statistics Yearbook 2007-2009*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	Officially released statistics; publicly accessible and reliable data source
Any comment:	To calculate OM and BM

Data / Parameter:	NCV_i
Data unit:	TJ/10^3 t
Description:	Net calorific value per mass or volume unit of fuel i
Source of data used:	*Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	IPCC 2006 default value
Any comment:	To calculate OM and BM

Data / Parameter:	$EF_{CO_2,i}$
Data unit:	tCO2/TJ
Description:	CO2 emission factor per energy unit of fuel i
Source of data used:	*Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	IPCC 2006 default value
Any comment:	To calculate OM and BM

Data / Parameter:	*Efficiency level of best technology commercially available in China for coal-fired power generation*
Data unit:	%
Description:	Efficiency level of best technology commercially available in China for coal-fired power generation
Source of data used:	*China DNA: Notification on Determining the Regional Grid Emission Factors of China released on Dec. 20th. 2010. http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2552.pdf*
Value applied:	39.08%
Justification of the choice of data or description of measurement methods and procedures actually applied:	Officially released statistics; publicly accessible and reliable data source
Any comment:	To calculate BM

Data / Parameter:	*Efficiency level of best technology commercially available in China for oil and gas-fired power generation*
Data unit:	%
Description:	Efficiency level of best technology commercially available in China for oil and gas-fired power generation
Source of data used:	*China DNA: Notification on Determining the Regional Grid Emission Factors of China released at Dec. 20th., 2010. http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2552.pdf*
Value applied:	51.46%
Justification of the choice of data or description of measurement methods and procedures actually applied:	Officially released statistics; publicly accessible and reliable data source
Any comment:	To calculate BM

Data / Parameter:	$CAP_{y,i}$
Data unit:	MW
Description:	The installed capacity of power generation sources j in (years) y (2006-2008, East China Power Grid)
Source of data used:	*China Electric Power Yearbook 2007-2009*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied:	Officially released statistics; publicly accessible and reliable data source
Any comment:	To calculate BM

B.6.3 Ex-ante calculation of emission reductions:

Short Description	Variable	Value	Unit
I). Emission reduciton due to methane avoidance	***$ER_{methane,y}$***	***52,185***	**tCO_2e/yr**
I.1) Baseline emissions due to methane avoidance	$BE_{methane,y}$	59,698	tCO_2e/yr
Volume of treated wastewater	$Q_{ww,i,y}$	5,013,640	m^3/yr
COD of removed by the anaerobic reactor	$COD_{removed,i,y}$	0.003185	t/m^3
Methane producing capacity of wastewater	$B_{o,ww}$	0.25	t CH_4/t COD
Methane correction factor for wastewater treatment system	$MCF_{ww,treatment,BL,i}$	0.8	-
Model correction factor to account for model uncertainties	UF_{BL}	0.89	
Global warming potential of methane	GWP_{CH4}	21	-
I.1) Baseline emissions methane	**$BE_{methane,y}$**	**59,698**	**tCO_2e/yr**
I.2) Project emissions due to methane avoidance	**$PE_{methane,y}$**	**7,513**	**tCO_2e/yr**
Volume of treated wastewater	$Q_{ww,y}$	5,013,640	m^3/yr
COD removedby the anaerobic reactor	$COD_{y,ww,removed,PJ,k,y}$	0.003185	t/m^3
Methane producing capacity of wastewater	$B_{o,ww}$	0.25	$tCH_4/tCOD$
Methane correction factor for wastewater treatment system	$MCF_{ww,treatment,PJ,k}$	0.8	-
Model correction factor to account for model uncertainties	UF_{PJ}	1.12	
Methane emission potential of wastewater treatment systems equipped with biogas recovery system	*$MEP_{ww,treatment,y}$*	*3,577*	*tCH_4/yr*
Capture efficiency of the biogas recovery equipment in the wastewater treatment systems	CFE_{ww}	0.9	-
Methane emission potential of wastewater treatment plant	$MEP_{ww,treatment,y}$	3577	tCH_4/yr
Global warming potential of methane	GWP CH_4	21	-
a) Fugitive project emissions	***$PE_{y,fugitive,ww}$***	***7,513***	***tCO_2e/yr***
b) Project emissions due to incomplete flaring	***$PE_{flaring,y}$***	**0**	***tCO_2e/yr***
Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h	***$FV_{RG,h}$***	**0**	***Nm^3/h***
Volumetric fraction of methane in the residual gas on dry basis in hour	***$fv_{CH4,RG,h}$***	**0**	
Density of methane at normal conditions	***$\rho_{CH4,n}$***	**0.7160**	***Kg/Nm^3***
Mass flow rate of methane in the residual gas in the hour h	***$TM_{RG,h}$***	**0**	***kg/h***

Flare efficiency in hour h	***$\eta_{flare,}$***	**50%**	
Global warming potential of methane	***GWP***	**21**	
Project emissions due to incomplete flaring	**$PE_{flare,y}$**	0	
I.3) Leakage		**0**	**tCO_2e/yr**
Emissions due to leakage effects	**$Leakage_{y,ww}$**	**0**	**tCO_2e/yr**
I.4) Emission reductions due to methane avoidance			
Emission Reductions due to methane avoidance	***$ER_{methane,y}$***	***52,185***	***tCO_2e/yr***
II) Emission reductions due to electricity displacement	***ER_y***	8,392	***tCO_2e/yr***
Grid Emission Factor Calculation 2008			
Operating Margin emission factor of regional grid	EF_{OM}	0.8592	tCO_2/MWh
Build Margin emission factor of regional grid	EF_{BM}	0.6789	tCO_2/MWh
Weight factor operating margin	W_{OM}	0.5	-
Weight factor build margin	W_{BM}	0.5	-
Combined Margin emission factor of regional grid	EF_{CM}	0.7690	tCO_2/MWh
Net Electricity supplied to the grid	$EG_{BL,y}$	10,914	MWh/yr
Combined margin emission factor of East ChinabPower Grid 2008	EF_{cm}	0.7690	tCO_2/MWh
1.2) Baseline emissions due to electricity displacement	**BE_y**	**8,392**	**tCO_2e/yr**
III)Total emission reductions	**$ER_{total,y}$**	60,577	**tCO_2e/yr**

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

Year	Estimations of project activity emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimations of leakage (tCO_2e)	Estimations of overall emission reductions (tCO_2e)
Year 1	7,513	68,090	0	60,577
Year 2	7,513	68,090	0	60,577
Year 3	7,513	68,090	0	60,577
Year 4	7,513	68,090	0	60,577
Year 5	7,513	68,090	0	60,577
Year 6	7,513	68,090	0	60,577
Year 7	7,513	68,090	0	60,577
Year 8	7,513	68,090	0	60,577
Year 9	7,513	68,090	0	60,577
Year 10	7,513	68,090	0	60,577
Total (tonnes of CO2e)	**75,130**	**680,900**	0	**605,770**

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

B.7.1 Data and parameters monitored:

1) Methane avoidance component:

Data / Parameter:	$Q_{ww,i,y}$
Data unit:	m^3/yr
Description:	Volume of wastewater treated in the year "y"
Source of data to be used:	The sum of the readings by two flow meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Expected annual wastewater volume to be treated 5,013,640 m^3/yr
Description of measurement methods and procedures to be applied:	A flow meter will be installed at each wastewater treatment plant (plant 1 and plant 2) to measure the flow of wastewater treated in anaerobic reactors continuously and record on a monthly basis by monitoring personnel (see below). $Q_{ww,y}$ would be the sum of the reading of these two flow meters.
QA/QC procedures to be applied:	▪ Trained and qualified staff is responsible for recording data from the flow meter ▪ Meter will be calibrated periodically according to relevant national standards
Any comment:	

Data / Parameter:	$Q_{ww,1,y}$
Data unit:	m^3/yr
Description:	Volume of wastewater treated in plant 1 the year "y"
Source of data to be used:	Measured by flow meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Expected annual wastewater volume to be treated 970,360 m^3/yr
Description of measurement methods and procedures to be applied:	A follow meter will be installed at plant 1 to measure the flow of wastewater treated in anaerobic reactors continuously and record on a monthly basis by monitoring personnel.
QA/QC procedures to be applied:	▪ Trained and qualified staff is responsible for recording data from the flow meter ▪ Meter will be calibrated periodically according to relevant national standards
Any comment:	

Data / Parameter:	$Q_{ww,2,y}$
Data unit:	m^3/yr
Description:	Volume of wastewater treated in plant 2 the year "y"
Source of data to be used:	Measured by flow meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Expected annual wastewater volume to be treated 4,043,280 m^3/yr
Description of measurement methods and procedures to be applied:	A follow meter will be installed at plant 2 to measure the flow of wastewater treated in anaerobic reactors continuously and record on a monthly basis by monitoring personnel.
QA/QC procedures to be applied:	▪ Trained and qualified staff is responsible for recording data from the flow meter ▪ Meter will be calibrated periodically according to relevant national standards
Any comment:	

Data / Parameter:	$COD_{ww,untreated,1,y}$
Data unit:	mg/l (or tCO2/m3)
Description:	Chemical oxygen demand of wastewater before the anaerobic treatment reactor/system with methane capture in plant 1 in the year "*y*"
Source of data to be used:	Laboratory test results
Value of data applied	Expected COD value before the existing anaerobic treatment is about

for the purpose of calculating expected emission reductions in section B.5	4,055mg/l.
Description of measurement methods and procedures to be applied:	By definition, chemical oxygen demand is "a measure of the oxygen equivalent of the organic matter content of a sample that is susceptible to oxidation by a strong chemical oxidant. Oxygen demand is determined by measuring the amount of oxidant consumed using an appropriate method that is in line with the national standards (e.g. titrimetric or photometric methods). Measured and recorded on a daily basis by monitoring personnel.
QA/QC procedures to be applied:	▪ Trained and qualified staff is responsible for data measurement and recordings ▪ Sample taking and laboratory tests are conducted in compliance with national standard of *Methods of Monitoring and Analyzing of Water and Wastewater (Version 4) (GB11914)*
Any comment:	The value used for CER calculations during the crediting period would have to meet the requirement of 90/10 confidence/precision level.

Data / Parameter:	$COD_{ww,treated,1,y}$
Data unit:	mg/l (or tCO2/m3)
Description:	Chemical oxygen demand after the anaerobic treatment reactor/system with methane capture in plant 1 the year "*y*"
Source of data to be used:	Measured via lab test in compliance with national standard of *Methods of Monitoring and Analyzing of Water and Wastewater (Version 4) (GB11914)*
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Expected COD value after the existing anaerobic treatment is about 900 mg/l.
Description of measurement methods and procedures to be applied:	By definition, chemical oxygen demand is "a measure of the oxygen equivalent of the organic matter content of a sample that is susceptible to oxidation by a strong chemical oxidant. Oxygen demand is determined by measuring the amount of oxidant consumed using an appropriate method that is in line with the national standards (e.g. titrimetric or photometric methods). Measured and recorded on a daily basis by monitoring personnel.
QA/QC procedures to be applied:	▪ Trained and qualified staff is responsible for data measurement and recordings ▪ Sample taking and laboratory tests are conducted in compliance with national standard of *Methods of Monitoring and Analyzing of Water and Wastewater (Version 4) (GB11914)*
Any comment:	The value used for CER calculations during the crediting period would have to meet the requirement of 90/10 confidence/precision level.

Data / Parameter:	$COD_{ww,untreated,2,y}$
Data unit:	mg/l (or tCO2/m3)
Description:	Chemical oxygen demand of wastewater before the anaerobic treatment reactor/system with methane capture in plant 2 in the year "*y*"
Source of data to be	Laboratory test results

used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Expected COD value before the existing anaerobic treatment is about 4,036 mg/l.
Description of measurement methods and procedures to be applied:	By definition, chemical oxygen demand is "a measure of the oxygen equivalent of the organic matter content of a sample that is susceptible to oxidation by a strong chemical oxidant. Oxygen demand is determined by measuring the amount of oxidant consumed using an appropriate method that is in line with the national standards (e.g. titrimetric or photometric methods). Measured and recorded on a daily basis by monitoring personnel.
QA/QC procedures to be applied:	▪ Trained and qualified staff is responsible for data measurement and recordings ▪ Sample taking and laboratory tests are conducted in compliance with national standard of *Methods of Monitoring and Analyzing of Water and Wastewater (Version 4) (GB11914)*
Any comment:	The value used for CER calculations during the crediting period would have to meet the requirement of 90/10 confidence/precision level.

Data / Parameter:	$COD_{ww,treated,2,y}$
Data unit:	mg/l (or tCO2/m3)
Description:	Chemical oxygen demand after the anaerobic treatment reactor/system with methane capture in plant 2 the year "*y*"
Source of data to be used:	Measured via lab test in compliance with national standard of *Methods of Monitoring and Analyzing of Water and Wastewater (Version 4) (GB11914)*
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Expected COD value after the existing anaerobic treatment is about 920 mg/l.
Description of measurement methods and procedures to be applied:	By definition, chemical oxygen demand is "a measure of the oxygen equivalent of the organic matter content of a sample that is susceptible to oxidation by a strong chemical oxidant. Oxygen demand is determined by measuring the amount of oxidant consumed using an appropriate method that is in line with the national standards (e.g. titrimetric or photometric methods). Measured and recorded on a daily basis by monitoring personnel.
QA/QC procedures to be applied:	▪ Trained and qualified staff is responsible for data measurement and recordings ▪ Sample taking and laboratory tests are conducted in compliance with national standard of *Methods of Monitoring and Analyzing of Water and Wastewater (Version 4) (GB11914)*
Any comment:	The value used for CER calculations during the crediting period would have to meet the requirement of 90/10 confidence/precision level.

Data / Parameter:	$BG_{burnt,y}$
Data unit:	m^3/yr
Description:	Amount of biogas combusted (fuelled) in the year "y"

Source of data to be used:	Measured by flow meters (normalized flow, otherwise temperature and pressure will be monitored and corrected)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Expected amount of methane to be recovered 5,100,000 m^3/yr under normal conditions
Description of measurement methods and procedures to be applied:	Measured continuously by a flow meter and recorded on a monthly basis by monitoring person
QA/QC procedures to be applied:	▪ Trained and qualified staff is responsible for recording data from the flow meter ▪ Meter will be calibrated periodically according to relevant national standards
Any comment:	

Data / Parameter:	$W_{CH4,,fuelled,y}$
Data unit:	% volume
Description:	Methane content in the biogas combusted (fuelled) in year "*y*"
Source of data to be used:	Measured with a gas analyser
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Typical fraction of methane in biogas is 65% to 75%
Description of measurement methods and procedures to be applied:	Measured and record continuously by qualified staff
QA/QC procedures to be applied:	▪ Trained and qualified staff is responsible for carrying out the measurements ▪ Analyser will be calibrated periodically according to relevant national standard
Any comment:	The gas analyzer will be installed according to the monitoring plan.

Data / Parameter:	$FV_{RG,h,1}$
Data unit:	Nm^3/h
Description:	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour *h* in plant 1
Source of data to be used:	Measured by flow meters (normalized flow, otherwise temperature and pressure will be monitored and corrected)
Value of data applied for the purpose of calculating expected emission reductions in	Nil. Methane will not be flared except for emergencies or maintenance.

section B.5	
Description of measurement methods and procedures to be applied:	Measured continuously by a flow meter and recorded on a monthly basis by monitoring person
QA/QC procedures to be applied:	▪ Trained and qualified staff is responsible for recording data from the flow meter ▪ Meter will be calibrated periodically according to relevant national standards
Any comment:	Methane will not be flared except for the period of emergency or maintenance. The flow meter will be installed according to the monitoring plan.

Data / Parameter:	$fv_{CH4,RG,h,1}$
Data unit:	% volume
Description:	Volumetric fraction of methane in the residual gas on dry basis in hour *h* in plant 1
Source of data to be used:	Measured with a gas analyser
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Typical fraction of methane in biogas is 65% to 75%
Description of measurement methods and procedures to be applied:	Measured and record continuously by qualified staff
QA/QC procedures to be applied:	▪ Trained and qualified staff is responsible for carrying out the measurements ▪ Analyser will be calibrated periodically according to relevant national standard
Any comment:	The gas analyzer will be installed according to the monitoring plan.

Data / Parameter:	$\eta_{flare,1}$
Data unit:	%
Description:	Amount of minutes per hour where a flame has a higher temperature then 500°C, whenever biogas is sent to the flare in plant 1. The flare efficiency is assumed to be 50% during this period of time. Whenever the flame temperature is detected to be lower than 500°C, the same is recorded and the same is detected for less than 20 minutes in an hour (whenever biogas is sent to flare), flare efficiency is assumed to be 0%. Otherwise flare efficiency is assumed to be 50%.
Source of data to be used:	Online temperature gauge, logging temperature reading every minute when gas is sent to flare.
Value of data applied for the purpose of	50% - for open flare. However no biogas is expected to be flared under normal condition.

calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	The flame detection period shall be compared to the period of biogas being sent to the flare. The flare efficiency is determined based on the ratio of these two values.
QA/QC procedures to be applied:	The meter shall be subject to at least once in three-year calibration according to the equipment's specifications and applicable industrial standards.
Any comment:	The online temperature gauge is will be installed according to the monitoring plan.

Data / Parameter:	$FV_{RG,h,2}$
Data unit:	Nm^3/h
Description:	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour *h* in plant 2
Source of data to be used:	Measured by flow meters (normalized flow, otherwise temperature and pressure will be monitored and corrected)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Nil. Methane will not be flared except for emergencies or maintenance.
Description of measurement methods and procedures to be applied:	Measured continuously by a flow meter and recorded on a monthly basis by monitoring person
QA/QC procedures to be applied:	▪ Trained and qualified staff is responsible for recording data from the flow meter ▪ Meter will be calibrated periodically according to relevant national standards
Any comment:	Methane will not be flared except for the period of emergency or maintenance. The flow meter will be installed according to the monitoring plan.

Data / Parameter:	$fv_{CH4,RG,h,2}$
Data unit:	% volume
Description:	Volumetric fraction of methane in the residual gas on dry basis in hour *h* in plant 2
Source of data to be used:	Measured with a gas analyser
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Typical fraction of methane in biogas is 65% to 75%
Description of	Measured continuously by qualified staff

measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	▪ Trained and qualified staff is responsible for carrying out the measurements ▪ Analyser will be calibrated periodically according to relevant national standard
Any comment:	The gas analyzer will be installed according to the monitoring plan.

Data / Parameter:	$\eta_{flare,2}$
Data unit:	%
Description:	Amount of minutes per hour where a flame has a higher temperature then 500°C, whenever biogas is sent to the flare in plant 2. The flare efficiency is assumed to be 50% during this period of time. Whenever the flame temperature is detected to be lower than 500°C, the same is recorded and the same is detected for less than 20 minutes in an hour (whenever biogas is sent to flare), flare efficiency is assumed to be 0%. Otherwise flare efficiency is assumed to be 50%.
Source of data to be used:	Online temperature gauge, logging temperature reading every minute when gas is sent to flare.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	50% - for open flare. However no biogas is expected to be flared under normal condition.
Description of measurement methods and procedures to be applied:	The flame detection period shall be compared to the period of biogas being sent to the flare. The flare efficiency is determined based on the ratio of these two values.
QA/QC procedures to be applied:	The meter shall be subject to at least once in three-year calibration according to the equipment’s specifications and applicable industrial standards.
Any comment:	The online temperature gauge is will be installed according to the monitoring plan.

Data / Parameter:	***Final disposal of sludge***
Data unit:	-
Description:	For the proposed project, the final sludge will be provided as material for free to another company outside of the project site for the productions of new products.
Source of data to be used:	Observed.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	n/a.

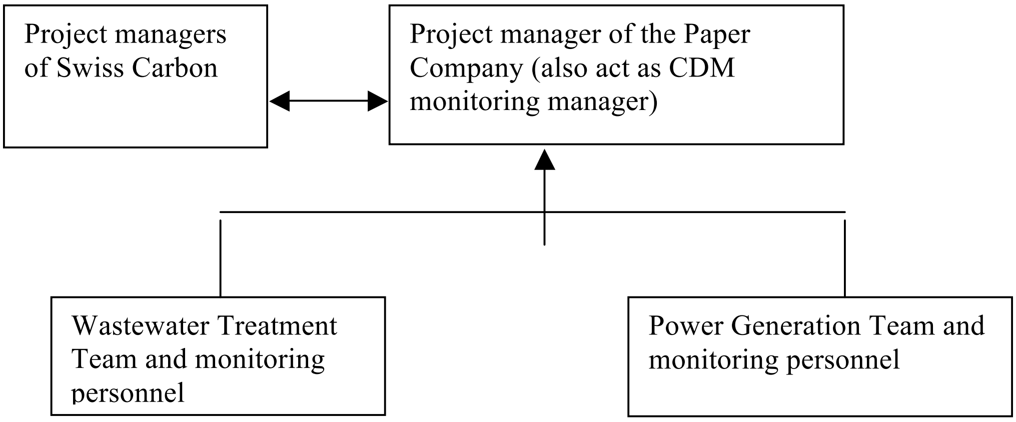
Description of measurement methods and procedures to be applied:	And the disposal of sludge remains unchanged as in the baseline scenario. Since sludge disposal has been defined as unaffected by the implementations of the project activity (see Section B.3). Therefore, only status of the sludge disposal system will be monitored, and it will not be quantified.
QA/QC procedures to be applied:	▪ Trained and qualified staff is responsible for carrying out the measurement
Any comment:	

2) Electricity generation component:

Data / Parameter:	EG_{BLy}
Data unit:	*MWh*
Description:	Quantity of net electricity displaced as a result of the implementation of the project activity in year *y*
Source of data to be used:	Measured and calculated by electricity meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The annual total net power supply by these four generators is expected to be 10,914 MWh/year.
Description of measurement methods and procedures to be applied:	Measured continuously by a double-way kilowatt meters and recorded on a monthly basis by monitoring personnel. During the period of maintenance and downtime, the electricity consumption will be also mentored by this meter for calculating project emissions.
QA/QC procedures to be applied:	▪ Trained and qualified staff is responsible for recording electricity supplied and consumed data from the kilowatt meters; ▪ Meters will be calibrated periodically according to relevant national standards.
Any comment:	▪ Only the net electricity generation shall be taken into account in ER calculation.

B.7.2 Description of the monitoring plan:

1. Management Structure
Following figure shows basic management structure of the Project. Project managers of Swiss Carbon Asset Management Co., Ltd. will make direct communication with project manager of Zhejiang Jingxing Paper Joint Stock Co., Ltd. regarding monitoring requirements of CDM. The project manager directly leads two teams, e.g. wastewater treatment plant team and power generation team. Team leaders report to project managers and manage team of operators. System maintenance, repairing and calibration service will be provided by a department of the plant on demand of the Project.



2. Education and training for CDM monitoring
Project managers of Swiss Carbon Assets Ltd. will perform a consultant role for CDM monitoring implemented by the Zhejiang Jingxing Paper Joint Stock Co. Ltd. They will offer annual training course and daily practical assistance for the CDM monitoring manager. The CDM monitoring manager is responsible for education and training of CDM monitoring chief/staff. The education and training include how to use, maintain and calibrate monitoring equipment (including on-site training), procedure for error detection and correction, data processing for calculation of emissions reductions, data archiving system (storage media, frequency of recording and backup, etc.), preparation of internal monitoring report and data entry method. The CDM monitoring manager will make the CDM monitoring chief/staff understand the importance of monitoring for the CDM project activity.

For effective education and training, the project manager of the paper company (also act as CDM monitoring manager) will provide several training courses to the CDM monitoring staff while receiving necessary support form third party technical experts. Necessary hours of education/training will be determined according to the experience and technical background of each monitoring personnel. In order to check level of understanding and skill, the project manager of the paper company will give paper tests and/or skill tests when they finished training courses if needed.

3. Monitors and Installation Positions
Following Figure 5 below shows major monitoring equipments and their positions. Table B.7 has short descriptions.

Table B.7 Monitored parameters and monitors locations

Symbol	Name in Section B.7	Descriptions and locations	Monitoring equipment	Relevant National Standard	Accuracy (Minimum)	Frequency of calibration
E	EG_{BLy}	Quantity of net electricity displaced as a result of the implementation of the project activity in year *y*. See Figure 5 and Section B.7 for detail.	Electricity meter	GB17167-2006 or other applicable standards.	1.0 or the accuracy required by corresponding standards.	1 year or the frequency required by corresponding standards.
F	$BG_{burnt,y}$ $FV_{RG,h,1}$ $FV_{RG,h,2}$	Amount of biogas combusted/flared in the year y. (normalized flow, it not, pressure and temperature will be monitored). See Section B.7 for detail.	Flow meter	JJG 640-1994 P41 or other applicable standards	2.5 or the accuracy required by corresponding standards.	2 year or the frequency required by corresponding standards.
C	$W_{CH4,,fuelled,y}$ $fv_{CH4,RG,h,1}$ $fv_{CH4,RG,h,2}$	Methane content that biogas fuelled at entrance of generators as well as the methane content that the biogas flared at both Plant 1 and 2.See Section B.7 for detail.	Gas analyser	JJG365-2008 or other applicable standards.	3 or the accuracy required by corresponding standards.	1 year or the frequency required by corresponding standards.
F_{ww}	$Q_{ww,1,y}$ $Q_{ww,2,y}$	Volume of wastewater treated in the year "y"(both plant 1 and 2). See Section B.7 for detail.	Flow meter	JJG1033-2007 P13 or other applicable standards.	2.5 or the accuracy required by corresponding standards.	2 year or the frequency required by corresponding standards.
COD	***CODww,untreated,1,y*** ***CODww,untreated,2,y*** ***CODww,treated,1,y*** ***CODww,treated,2,y***	COD content removed through the anaerobic reactors(both Plant 1 and 2). See Section B.7 for details. Both the COD content at inlet and outlet of the anaerobic reactors at plant 1 and 2 will be monitored.	Sampling and laboratory test by titrimetric or photometric methods	*GB11914* or other applicable standards.	5.0 or the accuracy required by corresponding standards.	N/A.

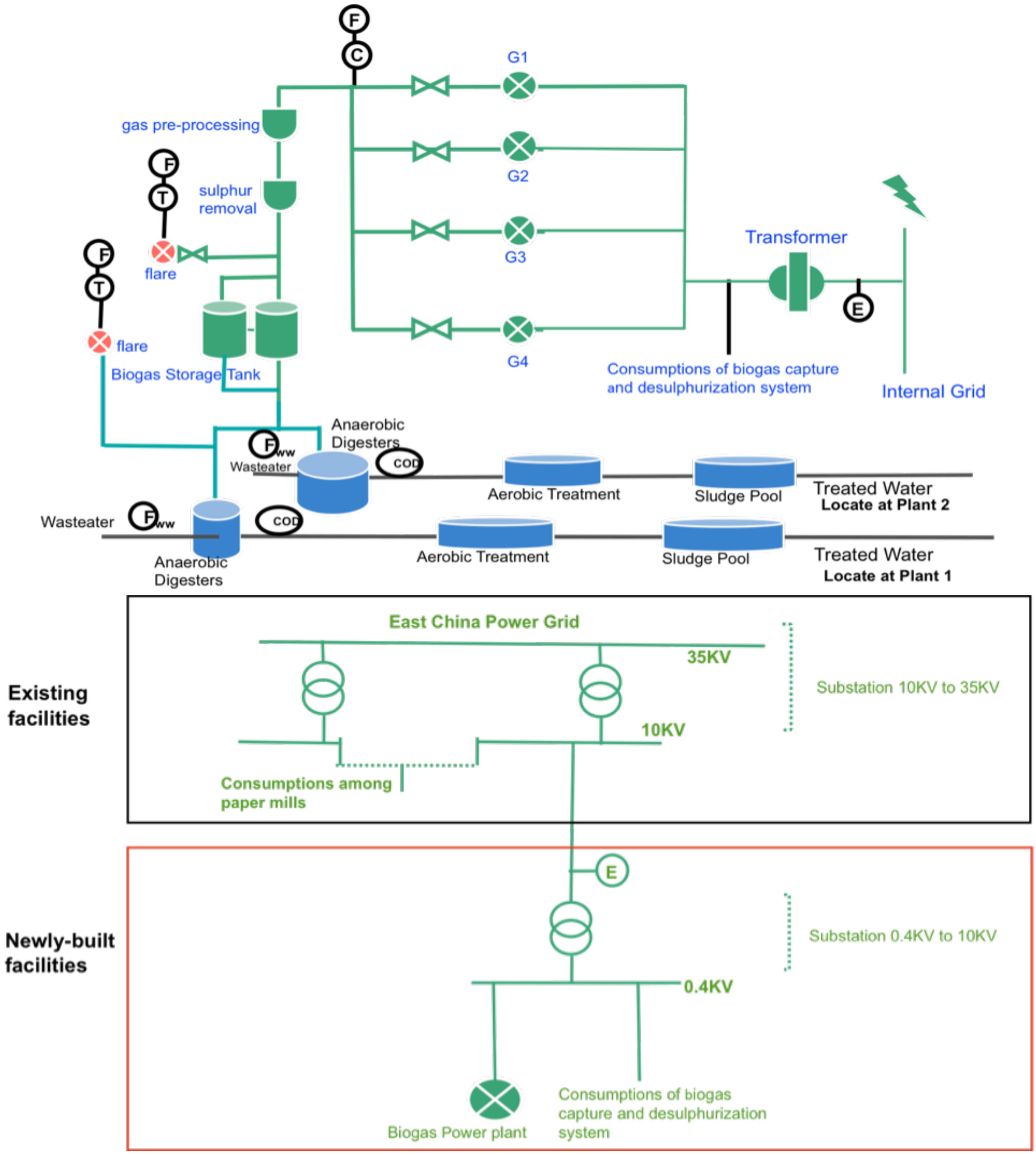


Figure 5 Monitors and their installation positions

3. Quality Assurance, Quality Control
The plant has published "*Regulations of Operation for Biogas-to-energy Plant*" and "*Operation Manual for Biogas-to-energy Plant*" for staff to follow and ensure normal operation.

4. Procedures for Calibration of Equipment
The plant operator carries out calibration according to relevant national standards. Section B.7 and Table 7 showed the detailed information about the main monitors, including location, accuracy, calibration, and so on. Few parts of the monitoring system are still not available currently, and actions will be taken soon to finalize the whole monitoring system.

5. Data Storage and Filing – Electric Workbook
All relevant data is stored electronically with the process control computer unit, external storage media and transferred. A daily log is printed and archived.

6. Measures to take in case of malfunction in major meters and equipments
Emission reductions are generally calculated based on amount of biogas recovered and power generation. While, in case of emergency or malfunctions in major meters, following measures will be taken for ER calculation:

- In case of emergency/malfunction in generators, a flare will start working and emission reductions will be calculated as zero during this period for simplicity and conservative;
- Proposed project will install backup meters for power generation;
- Ratio between power generation and biogas amount will be used in case of biogas monitoring is in abnormal conditions. Proper conservative approach will be taken.

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

Name of persons determining the baseline and monitoring methodology:
Mingming Sun and Da Fei Huang

Swiss Carbon Assets Ltd.
Technoparkstrasse 1
8005 Zurich, Switzerland
Phone: +41 44 633 78 70
Fax: +41 44 633 14 23
info@southpolecarbon.com

Swiss Carbon Assets Ltd. is a project participant of the project. Please refer to Annex 1 for detailed contact information.
Date of final revision of baseline study and monitoring plan: 9th May 2011.

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:

13/12/2008[19]

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

The expected operational lifetime of the project activity is 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:

Not applicable.

C.2.1.2. Length of the first crediting period:

Not applicable.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/10/2011

C.2.2.2. Length:

10 year

[19] The first equipment purchase contract was signed on December 13th 2008, which was the first real action taken to implement the project.

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

According to the relevant environmental law and regulations, an Environmental Impact Assessment Form has been prepared on November 2008, which has been approved by Pinghu Municipal EPA on 21st Nov. 2008. The main assessment conclusions are provided below:

1. Impact on the air quality
The dust generated during the construction period will effectively controlled through effective onsite management and related bylaws which will have less impact on the environment. After the project put into operation, the major products of combustion is CO2 and H2O, which do not harm atmosphere at all. There will be a few of SO2, but Emission Limits (GB16297-1996) will be met by venting through a flue at height of over 15 meters. The limits by this standard are $SO2 \leq 550 mg/m^3$. Considering that in absence of the project activity all methane would have been directly vented into atmosphere and cause more GHG emissions, the implementation of the project will improve the regional air quality significantly.

2. Noise impact
The major noise resources during the construction period are the operating equipments, the transportation and so on, and the noise impacts the builders and the residents nearby. In order to minimize the noise impacts, few measures are carried out, such as constructing under Noise Limits for Construction Site (GB12348-2008, type IV) strictly, enforcing the onsite management and establishing related bylaws. The noise during the construction period has locality and temporality characteristic; it will disappear when the construction work finished. After the project is put into operation, the major resource of noise pollution is from running of the generator. The muffler is installed to avoid the noise impact on the local citizens and employees.

3. Impact on the aquatic environment
The project activity only consists of methane recovery and combustion for electricity generation. Hence there will not be additional wastewater generated.

4. Impact of solid waste on the environment
There is no solid water generated because of the implementations of the project activity.

5. Impact on water and soil loss
Construction of the project will not lead to any water and soil loss.

6. Impact on the ecological environment
All construction activity will take place on vacant factory building. Occupied area is quite small hence plants of the factory will not be destroyed. Therefore, the project has little impact on the local eco-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:

The project participants and the host party involved consider negative environmental impacts of the project to be marginal. Comparing the environmental impacts and the mitigation measures mentioned above to the contribution of the project towards sustainable development on a regional and national level, the project will have an overall positive impact on the local and global environment.

SECTION E. Stakeholders' comments

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

57 questionnaires were distributed to residents who may be impacted by the project in May 2010 to collect comments and advices. The aim of these questionnaires is to collect opinions concerning the influence that the project might have on the local society, environment, economy, daily life etc.

Project participants will also upload the project documents to the Internet to invite comments from global stakeholder.
Preparation of the questionnaire forms was in compliance with:
- Appendix E of the Gold Standard Manual: Public Consultation: Checklist

The questions on the questionnaires are:

1. Do you know the methane recovery and utilization project in Jingxing Paper Co., Ltd?
2. What kind of impact do you think will the project exert on the local environmental?
3. Do you think the project will promote the local economic development?
4. What is your attitude towards the project?
5. Do you support the project to apply for CDM?
6. Do you have any comments or advices?

E.2. Summary of the comments received:

All 57 questionnaires have been returned; the results are summarized as below:

Background information of the respondents

The following is the summary background information of the residence:

Option		Statistics (percentage)
Sex	Male	70.2%
	Female	29.8%
Age	Younger than 20	1.8%
	20-30	8.8%
	30-45	35.1%
	45-60	31.7%
	Older than 60	22.6%
Education	Elementary school	7%
	Middle school	52.6%
	Collage/university	35.1%
	Others	5.3%
Occupation	Cadre	17.5%
	Worker	26.3%
	Farmer	43.9%
	Trader	0%
	Student	3.5%
	Others	8.8%

Summary of the result:
96% (55 out of 47) people involved in the survey have known the project, 4% did not know.

95% (54 out of 57) people believed the project would improve local environmental quality, especially the air quality, 5% people thought the project would lead to certain levels noise,
96% (55 out of 57) people believed the project would promote local economic development, particularly on creating job opportunities and increase the income, 4% was in neutral.
96 (55 out of 57) people supported the project, 4% was in neutral.
100% people supported the project to apply for CDM.
No comments or advices were received during the survey.

Attitude of the residence towards of the project

The survey shows that the project receives very strong support from local residents (100%). Almost all the people think the project will bring significant benefits to local community, such as improve air quality, crease new job opportunities, increase the income of the communities, etc.

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

No comments were received. The residents and local government are all very supportive of the project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

The Project Owner

Organization:	Zhejiang Jingxing Paper Joint Stock Co., Ltd.
Street/P.O.Box:	
Building:	Jingxing Industry Area
City:	Pinghu City
State/Region:	Zhejiang Province
Postfix/ZIP:	
Country:	P. R. China
Telephone:	+86 573 85960318
FAX:	+86 573 85966983
E-Mail:	Zhangaiqi5768924@163.com
URL:	
Represented by:	Mr. Zhu Zailong
Title:	
Salutation:	
Last Name:	Zhu
Middle Name:	
First Name:	Zailong
Department:	
Mobile:	
Direct FAX:	+86 573 85960318
Direct tel:	+86 573 85966983
Personal E-Mail:	Zhangaiqi5768924@163.com

The CER Purchase Facility Manager:

Organization:	Swiss Carbon Assets Ltd.
Street/P.O.Box:	Technoparkstr. 1
Building:	/
City:	Zurich
State/Region:	Zurich
Postfix/ZIP:	8005
Country:	Switzerland
Telephone:	+41 43 501 35 50
FAX:	+41 43 501 35 99
E-Mail:	r.heuberger@southpolecarbon.com
URL:	www.southpolecarbon.com
Represented by:	Renat Heuberger
Title	/
Salutation:	Mr.
Last Name:	Heuberger
Middle Name:	/
First Name:	Renat
Department:	/
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Direct FAX:	+41 43 501 35 99
Direct Tel:	+41 43 501 35 50
Personal E-Mail:	r.heuberger@southpolecarbon.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I Parties for this Project

Annex 3

BASELINE INFORMATION

Table 1–Fuels Parameters

Fuel	NCVs (kJ/kg)	Emission Factor (kgCO_2/TJ)
Coal	20908	87,300
Washed coal	26344	87,300
Other washed coal	8363	87,300
Moulded coal	20908	87,300
Coke	28435	95,700
Crude oil	41816	71,100
Gasoline	43070	67,500
Diesel	42652	72,600
Fuel oil	41816	75,500
Other petroleum products	41816	75,500
Natural gas	38931	54,300
Coke oven gas	16726	37,300
Other gas	5227	37,300
LPG	50179	61,600
Refinery gas	46055	48,200

Data sources:

NCVs are from *China Energy Statistical Yearbook 2008, P283.*

EFco2 are from *2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 2 Energy, Chapter 1, P1.21-1.22, Table 1-3, and Table 1-4.*

Table 2- OM Emission Factor of East China Power Grid in 2006

Fuels	Units	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	Potential emission factor	OXID	Fuel Emission Factor	NCV	Emission(tCO2e)
								(tc/TJ)	(%)	($kgCO_2/TJ$)	(MJ/t,km3)	K=F×I×J/100000 (in mass)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F×I×J/10000 (in volume)
Raw coal	10000tones	2744.45	10945.42	6065	3455.2	2369.63	**25579.7**	25.8	100	87,300	20,908	466,898,181
Washed coal	10000tones						**0**	25.8	100	87,300	26,344	0
other washed coal	10000tones		150.54		23.06		**173.6**	25.8	100	87,300	8,363	1,267,436
coke	10000tones			39.07			**39.07**	29.2	100	95,700	28,435	1,063,184
coke oven gas	0.1billion m3	1.71	3.13	0.23	0.71		**5.78**	12.1	100	37,300	16,726	360,603
other gas	0.1billion m3	84.64	106.54	3.28	25.12		**219.58**	12.1	100	37,300	5,227	4,281,088
crude oil	10000tones			20.3			**20.3**	20	100	71,100	41,816	603,543
Gasoline	10000tones						**0**	18.9	100	67,500	43,070	0
Diesel	10000tones	2.13	3.7	4.11	1.21	1.11	**12.26**	20.2	100	72,600	42,652	379,635
Fuel oil	10000tones	44.51	3.77	71.98	0.02	4.5	**124.78**	21.1	100	75,500	41,816	3,939,439
LPG	10000tones						**0**	17.2	100	61,600	50,179	0
Refinery gas	10000tones	0.29	0.4		2.95		**3.64**	15.7	100	48,200	46,055	80,803
Natural gas	0.1billion m3	3.2	13.5	9.18			**25.88**	15.3	100	54,300	38,931	5,470,911
other petroleum products	10000tones	18.82	3.57				**22.39**	20	100	72,200	41,816	675,980
other coking products	10000tones						**0**	25.8	100	95,700	28,435	0
other energy	10000tCe	6.66	2.8	27.45	3.21		**40.12**	0	0	0	0	0
											Total	485,020,803

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Thermal Power Generation within East Grid in 2006

Provinces	Power Generation	Power Generation	Auxiliary Power Consumption	Power Delivered to the Grid					
	(10^8 kWh)	(MWh)	(%)	(MWh)		Net Import from Yangcheng (MWh)	11,150,820	Net Import from Central Grid (MWh)	24,029,150
Shanghai	720.33	72,033,000	5.06	68,388,130		Average OM of Yangcheng (tCO2/MWh)	0.997020	Average OM Central China (tCO2/M	1.12157
Jiangsu	2512.58	251,258,000	5.69	236,961,420					
Zhejiang	1403.49	140,349,000	5.62	132,461,386					
Anhui	718.67	71,867,000	6.05	67,519,047		total emission tCO2	**523,088,703**		
Fujian	555.8	55,580,000	4.51	53,073,342		Total power generation l	**593,583,295**		
Total				558,403,325	**2006**	OM	**0.88124**		

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$EF_{om,2006}$=0.88124 tCO_2/MWh

Table 3- OM Emission Factor of East China Power Grid in 2007

Fuels	Units	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	Potential emission factor	OXID	Fuel Emission Factor	NCV	Emission(tCO2e)
								(tc/TJ)	(%)	($kgCO_2$/TJ)	(MJ/t,km3)	K=F×I×J/100000 (in mass)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F×I×J/10000 (in volume)
Raw coal	10000tones	2754.04	11060.78	7350	3929.9	3097.87	**28192.59**	25.8	100	87,300	20,908	514,590,436
Washed coal	10000tones						**0**	25.8	100	87,300	26,344	0
other washed coal	10000tones		459.17		29.32		**488.49**	25.8	100	87,300	8,363	3,566,416
coke	10000tones			35.06			**35.06**	29.2	100	95,700	28,435	954,063
coke oven gas	0.1billion m3	0.89	9.73	0.22	1.56	0.75	**13.15**	12.1	100	37,300	16,726	820,402
other gas	0.1billion m3	98.92	70.45	3.41	36.3	1.71	**210.79**	12.1	100	37,300	5,227	4,109,712
crude oil	10000tones			15.15			**15.15**	20	100	71,100	41,816	450,427
Gasoline	10000tones						**0**	18.9	100	67,500	43,070	0
Diesel	10000tones	1.23	5.37	2.76		1.01	**10.37**	20.2	100	72,600	42,652	321,111
Fuel oil	10000tones	40.76	1.55	29.52		2.04	**73.87**	21.1	100	75,500	41,816	2,332,156
LPG	10000tones						**0**	17.2	100	61,600	50,179	0
Refinery gas	10000tones	0.2	0.63		2.55		**3.38**	15.7	100	48,200	46,055	75,031
Natural gas	0.1billion m3	4.61	19.17	11.01			**34.79**	15.3	100	54,300	38,931	7,354,444
other petroleum products	10000tones	20.39	2.78				**23.17**	20	100	72,200	41,816	699,529
other coking products	10000tones						**0**	25.8	100	95,700	28,435	0
other energy	10000tCe	6.89	28.88	44.93	7.52	9.43	**97.65**	0	0	0	0	0
											total	535,273,726

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Thermal Power Generation within East Grid in 2007

Provinces	Power Generation	Power Generation	Auxiliary Power Consumption	Power Delivered to the Grid
	(10^8 kWh)	(MWh)	(%)	(MWh)
Shanghai	726	72,600,000	4.72	69,173,280
Jiangsu	2709	270,900,000	5.55	255,865,050
Zhejiang	1723	172,300,000	5.83	162,254,910
Anhui	848	84,800,000	5.92	79,779,840
Fujian	723	72,300,000	5.59	68,258,430
Total				635,331,510

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	Net Import from Yangcheng (MWh)	12,773,620	Net Import from Central Grid (MWh)	31,823,310
	Average OM of Yangcheng (tCO2/MWh)	0.972544	Average OM Central China (tCO2/M	1.10197
	Total emission tCO2	**582,765,074**		
	Total Power generation	**679,928,440**		
2007	OM	**0.85710**		

$EF_{om,2007}$=0.85710 tCO_2/MWh

Table 4- OM Emission Factor of East China Power Grid in 2008

Fuels	Units	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	Potential emission factor	OXID	Fuel Emission Factor	NCV	Emission(tCO2e)
								（tc/TJ）	（%）	($kgCO_2$/TJ)	（MJ/t,km3）	K=F×I×J/100000（in mass）
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F×I×J/10000 (in volume)
Raw coal	10000tones	2964.04	10890.2	7316.17	4887.18	3264.88	**29322.47**	25.8	100	87,300	20,908	535,213,779
Washed coal	10000tones						**0**	25.8	100	87,300	26,344	0
other washed coal	10000tones		513.34		33.49		**546.83**	25.8	100	87,300	8,363	3,992,351
coke	10000tones			31.12			**31.12**	29.2	100	95,700	28,435	846,847
coke oven gas	0.1billion m3	0.5	11.65	0.13	5.62	0.31	**18.21**	12.1	100	37,300	16,726	1,136,085
other gas	0.1billion m3	98.42	77.84	3.57		6.36	**186.19**	12.1	100	37,300	5,227	3,630,092
crude oil	10000tones			8.31			**8.31**	20	100	71,100	41,816	247,066
Gasoline	10000tones						**0**	18.9	100	67,500	43,070	0
Diesel	10000tones	5.85	4.04	2.05		1.04	**12.98**	20.2	100	72,600	42,652	401,930
Fuel oil	10000tones	24.43	0.39	13.48		1.81	**40.11**	21.1	100	75,500	41,816	1,266,316
LPG	10000tones						**0**	17.2	100	61,600	50,179	0
Refinery gas	10000tones	0.05	0.28		1.5	0.57	**2.4**	15.7	100	48,200	46,055	53,276
Natural gas	0.1billion m3	3.65	25.14	8.99		0.19	**37.97**	15.3	100	54,300	38,931	8,026,681
other petroleum products	10000tones	21.33	3.09				**24.42**	20	100	72,200	41,816	737,268
other coking products	10000tones						**0**	25.8	100	95,700	28,435	0
other energy	10000tCe	15.88	62.57	34.54		8.99	**121.98**	0	0	0	0	0
											total	555,551,691

China Energy Statistical Yearbook 2009

Thermal Power Generation within East Grid in 2008

Provinces	Power Generation	Power Generation	Auxiliary Power Consumption	Power Delivered to the Grid
	（10^8 kWh)	（MWh)	（%）	（MWh)
Shanghai	794	79,400,000	4.88	75,525,280
Jiangsu	2735	273,500,000	5.51	258,430,150
Zhejiang	1748	174,800,000	5.77	164,714,040
Anhui	1074	107,400,000	5.72	101,256,720
Fujian	748	74,800,000	5.61	70,603,720
Total				670,529,910

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Net Import from Yangcheng (MWh)	16,903,640	Net Import from Central Grid (MWh)	35,684,610
Average OM of Yangcheng (tCO2/MWh)	1.004945	Average OM Central China (tCO2/M	1.04205

	Total emission tCO2	**609,724,068**
	Total Power generation	**723,118,160**
2008	OM	**0.84319**

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} = 0.8592 \ tCO_2/MWh$$

Table 5 - Calculation of Ratio of Solid, Liquid and Gas fuel in total CO_2 Emission

Fuels	Units	Shanghai A	Jiangsu B	Zhejiang C	Anhui D	Fujian E	Total G=A+…+F	NCV H	Emission factor I	OXID J	Emission (tCO2) K=G×H×I×J/100,000
Raw coal	10000t	2,964.04	10,890.20	7316.17	4,887.18	3,264.88	29,322.47	20,908	87,300	1	535,213,779
Washed coal	10000t	0	0	0	0	0	0.00	26,344	87,300	1	0
Other washed coal	10000t	0	513.34	0	33.49	0	546.83	8,363	87,300	1	3,992,351
Biquitte coal	10000t	0	0	0	0	0	0.00	20,908	87,300	1	0
Coke	10000t	0	0	31.12	0	0	31.12	28,435	95,700	1	846,847
Other coke products	10000t	0	0	0	0	0	0.00	28,435	95,700	1	0
Total											**540,052,976**
Crude oil	10000t	0	0	8.31	0	0	8.31	41,816	71,100	1	247,066
Gasoline	10000t	0	0	0	0	0	0	43,070	67,500	1	0
Diesel	10000t	5.85	4.04	2.05	0	1.04	12.98	42,652	72,600	1	401,930
Fuel oil	10000t	24.43	0.39	13.48	0	1.81	40.11	41,816	75,500	1	1,266,316
Other petroleum	10000t	21.33	3.09	0	0	0	24.42	41,816	72,200	1	737,268
Total											**2,652,580**
Natural gas	0.1billionm^3	36.5	251.4	89.9	0	1.9	379.7	38,931	54,300	1	8,026,681
Coke oven gas	0.1billionm^3	5	116.5	1.3	56.2	3.1	182.1	16,726	37,300	1	1,136,085
Other gas	0.1billionm^3	984.2	778.4	35.7	0	63.6	1861.9	5,227	37,300	1	3,630,092
LPG	0.1billionm^3	0	0	0	0	0	0	50,179	61,600	1	0
Refinery gas	0.1billionm^3	0.05	0.28	0	1.5	0.57	2.4	46,055	48,200	1	53,276
Total											**12,846,135**
Total											**555,551,691**

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

$= 0.7931\ tCO_2/MWh$

Table6–The Calculation of BM Emission Factor for the East China Power Grid

	Installed capacity in 2006	Installed capacity in 2007	Installed capacity in 2008	Newly added installed capacity 2006-2008	Newly added installed capacity 2007-2008	Proportion against newly added installed capacity
	A	B	C	D	E	F
Thermal power	128,828	138,650	148,700	32,640	18,116	85.60%
Hydro-power	18,463	19,970	22,240	2,972	1,336	7.80%
Nuclear power	3,066	5,070	5,070	2,004	0	5.26%
Wind power	547	1,096	1,060	513	-36	1.35%
Total	150,904	164,786	177,070	**38,129**	**19,416**	100.00%
Share in 2008 installed				21.53%	10.97%	

$EF_{BM,y}$=0.7931×85.6%= 0.6789 tCO_2/MWh

$EF_{grid,CM,y} = w_{OM} \cdot EF_{grid,OM,y} + w_{BM} \cdot EF_{grid,BM,y}$ =0.5*0.8592+0.5*0.6789=0.7690 tCO2/MWh