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

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

Fuqing MSW Incineration Project

Version: 04

Date: 06/09/2012

Revision History:

Version 01	08/07/2011	GSP version
Version 02	20/04/2012	Revised version for clarifications and corrective action requests from the DOE
Version 03	22/05/2012	Revised version for further comments from the DOE
Version 03.1	24/05/2012	Revised version for further comments from the DOE
Version 04	06/09/2012	Revised version for comments from EB review

A.2. Description of the project activity:

Fuqing MSW Incineration Project (hereafter refers to as the Project activity or the Project) is located in the Cangxia Village, Longjiang Street, Fuqing City, Fujian Province, P.R China and operated by C&G Environmental Protection (Fuqing) Co., Ltd.

The Project is designed to treat 300,000 tonnes of municipal solid waste (MSW) per year. The MSW in Fuqing city will be collected and delivered to the plant by the public sanitation department. Collected MSW will be incinerated by 3 units of two-stage mechanical grate incinerator with MSW incineration capacity of 300t/d for each, the steam from the incineration units will be used to generate power through 18 MW (1*12MW+1*6MW) condensing turbine generators. The plant is expected to export 87,703 MWh to the East China Power Grid per year.

The MSW to be used in the Project would have been disposed of in the Fuqing Yibadi Landfill site which is located in Cangxia village and is about 100 meters away from the proposed project. The Yibadi Landfill site was put into use in 1995 and extended its capacity in 2005, it is the only landfill site in Fuqing city and all of the MSW were transported to the Yibadi Landfill site before the implementation of the proposed project. The landfill site was simple equipped and had no landfill gas capturing system thus will cause significant greenhouse gas (GHG) emissions. After the implementation of the Project, the MSW generated in Fuqing city were transported to the project site, only residuals from the Project and other industrial waste in the city will be disposed of in the landfill site. In addition, prior to the implementation of the Project, the electricity is supplied by the East China Power Grid. Above scenario is the scenario prior to the Project, which is also the baseline scenario to the Project. There is no heat

utilization involved in the Project, heat generation has not been considered in the emission reduction calculation, and is therefore not included in the baseline scenario.

The operation of this new MSW incineration project is estimated to deliver a total of 1,127,283 tCO_2e emission reductions during the 10-year crediting period. The emission reductions will be achieved through the following:

1. Avoided CH_4 emissions caused by the disposal of MSW at the Fuqing Yibadi Landfill site; and
2. Avoided CO_2 emissions from displacing fossil fuel-fired power in the East China Power Grid by exporting electricity generated by the project to the East China Power Grid.

The baseline scenario for the Project is: The disposal of municipal solid waste in a landfill site without capturing landfill gas. The electricity is obtained from an existing grid-connected power plant. There is no heat utilization involved in the Project, heat generation has not been considered in the emission reduction calculation, and is therefore not included in the baseline scenario. The baseline scenario is the same as the scenario existing prior to the start of implementation of the Project.

The contributions of the Project to local, host country and global environment and economy sustainable developments are shown as follows:

- **Environmental sustainability** – Presently, MSW of Fuqing city is disposed of in the Fuqing Yibadi landfill, which would cause methane emission at the landfill site. The Project activity not only reduces GHG emissions it also reduces other harmful pollutants caused by landfill treatment and fossil-fuelled power generation, therefore, it will make significant improvement on local environment.

- **Resources sustainability** –The Project will provide 87,703 MWh annually to the East China Power Grid by utilizing waste as the primary fuel, which will lead to reduction in fossil fuel usage.

- **Economic sustainability** -Implementation of the Project will provide employment opportunities during project construction and operation stage and will therefore increase local residents' incomes and improve their quality of life.

A.3. Project participants:

Name of Party involved(*) ((host) indicates a Host Party)	Private and/or public entity(ies) project participants(*)(as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R. China(host)	C&G Environmental Protection (Fuqing) Co., Ltd.	No
Finland	Fine Carbon Fund Ky	No
Finland	Nordic Carbon Fund Ky	No
Finland	GreenStream Network Plc	No

Finland	Fine Post-2012 Carbon Fund Ky	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party (ies) involved is required.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

Fuqing City, Fujian Province, China

A.4.1.1. Host Party (ies):

P.R.China

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

Fujian Province

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

Fuqing City

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

The Project is located in the Cangxia Village, Longjiang Street, Fuqing City, Fujian Province. The geographical coordinates in the central of the Project are Latitude 25°40′42″; Longitude 119°22′3″. The location of the Project is shown in the maps as follows:

Fig A.4.1-1 The location of Fuqing MSW Incineration Project

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

This Project activity would fall within 2 sectoral scopes:

Category 13: Waste handling and disposal; and

Category 1: energy industries.

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

The Project is designed to install 3 units of two-stage mechanical grate incinerators with MSW disposal capacity of 300t/d for each and 18 MW (1*12MW+1*6MW) condensing turbine generators. Each incinerator is allocated one exhaust-heat boiler. All the equipments adopted in the proposed project are domestically developed. The plant is expected to export 87,703 MWh to the East China Power Grid per year.

The amount of electricity generated is calculated below:

$EG_y = LHV_{design} * \eta * Q_{MSW} * 10^3 / 3600$

Where:

EG_y	Is the total amount of electricity generated in the project activity during the year y (kwh)
LHV_{design}	Is the designed low heat value[1] (KJ/kg)
η	Is the thermal efficiency of waste heat utilization[2] (%)
Q_{MSW}	Is the amount of MSW delivered to the plant during the year y (tonne/a)
3600	Is the transformation factor (KJ/kwh)

$EG_y = 6700 * 20.4\% * 300{,}000 * 10^3 / 3600 = 113{,}900$ MWh

The onsite electricity consumption rate of the project under the designed LHV is 22% and the transmission loss rate is 1%, so the electricity exported to the East China Power Grid is:

Electricity exported=113,900 * (1-22%-1%) = 87,703 MWh

The main process of MSW incineration and electricity generation is as follows:

Collected MSW placed in waste storage, which can ensure a steady and continuous supply of fuel for the incineration process. The waste is fed into the incinerator, which is installed with furnace bed composed of both fixed and moving fire grate blocks, by which the MSW is stirred thereby providing desiccated MSW for combustion. The combusting temperature is controlled not lower than 850°C. The gas produced by the incineration process will flow into an exhaust-heat boiler for steam production; the steam will then be used to generate power through condensing turbine generators. The purified flue gas will vent into the atmosphere by chimney.

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[1] The Incinerator and Boiler technical contract.

[2] The thermal efficiency of waste heat utilization is 20.4% which is estimated by the designer of FSR, China City Construction Research Institute. Thermal efficiency of waste heat utilization is defined as the heat efficiency of the whole waste heat utilization system and is the product of thermal efficiency of incineration boiler, channel, turbine and generator.

The data of thermal efficiency of waste heat utilization used in the Project can be cross checked by "Study on method of estimating power generation during operation for a BOT project of refuse-incineration power generation" issued in April, 2008 and "Research on Generated Energy per Ton of Waste by Domestic Waste Incineration Plants" published on Chinese professional journal Environmental Sanitation Engineering, Vol.18, No.5, October 2010.

The purification process adopted in this Project is semi-dry process combined of rapid cooling, semi-dry neutralization, active carbon adsorption and bag dust elimination. The purification technology can ensure that the flue gas emissions fall within the national standards required.

Residual from incineration will be removed and transported to landfill. Fly ash will be treated through a process of solidification; the solidified fly ash will be transported to landfill. Leachate will be treated to ensure that national emission standards are met and then discharged into the sewage treatment plant.

The parameters of the main equipments of the Project are in the following tables.

Table 4.3-1 The parameters of Waste Incinerator

Parameter	Unit	Data
Amount	set	3
MSW disposal capacity	t/d	300
Residence time of flue gas in the furnace	sec.	⩾2
Residence time of MSW in the incinerator	sec.	~1.5
Load range	%	60~110
Technical lifetime	years	30

Table 4.3-2 The parameters of Turbine

Parameter	Unit	Data	
Model	/	N12-3.82-13	N6-3.82-13
Amount	set	1	1
Capacity	MW	12	6
Rated steam capacity	t/h	59	32
Rated steam pressure inflow	MPa	3.82	
Technical lifetime	years	30	

Table 4.3-3 The parameters of Generator

Parameter	Unit	Data	
Model	/	QFW-12-2A	QFW-6-2A
Amount	set	1	1
Capacity	MW	12	6
Rated rotation speed	rpm	3000	
Power factor	/	0.8	
Frequency	HZ	50	

Technical lifetime	years	30

Table 4.3-4 The parameters of Boiler

Parameter	Unit	Data
Model	/	SLC300-4.1/400
Amount	set	3
Rated steam pressure	MPa	4.1
Rated steam temperature	℃	400
Technical lifetime	years	25

Table 4.3-5 The parameters of Wastewater Treatment

Parameter	Unit	Data
Leachate store pool	m^3	400
Leachate treatment design scale	t/d	200

There are three forms of GHG involved in the project activity: methane, nitrous oxide and carbon dioxide. Methane is from the existing landfill site which will be partially avoided by implementing the project activity and from the combustion of the waste. Nitrous oxide is from waste combustion process. Carbon dioxide is from combustion of fossil-based waste. The details of emission sources are shown in Table B3.1.

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

It is expected that the Project will generate a total of 1,127,283 tCO_2e emission reductions during the 10-year crediting period. The detailed information on estimation of emission reduction is presented as follows:

Years	Annual estimation of emission reductions in tonnes of CO_2 e
01/09/2012-31/08/2013	36,086
01/09/2013-31/08/2014	68,155
01/09/2014-31/08/2015	90,975
01/09/2015-31/08/2016	107,506
01/09/2016-31/08/2017	119,740
01/09/2017-31/08/2018	129,017
01/09/2018-31/08/2019	136,240
01/09/2019-31/08/2020	142,020
01/09/2020-31/08/2021	146,771
01/09/2021-31/08/2022	150,774

Total estimated reductions (tonnes of CO_2 e)	1,127,283
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	112,728

A.4.5. Public funding of the project activity:

There is no public funding from Annex I parties for this Project.

SECTION B. Application of a baseline and monitoring methodology

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

- AM0025. Version 12 - “Avoided emissions from organic waste through alternative waste treatment processes”.
- “Tool to calculate the emission factor for an electricity system” (Version 02.2.1)
- “Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site” (Version 05.1.0).
- “Tool for the demonstration and assessment of additionality” (Version06.0.0).

For more information please refer to the UNFCCC CDM-Executive Board website under the following link: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

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

AM0025 is applicable to projects that involve the incineration of fresh waste (including Municipal Solid Waste), fresh waste that would otherwise be disposed of in a landfill, and the generation of electricity from the waste incineration process.

The Project meets the applicability conditions of the methodology AM0025 (Version 12) as follows:

Requirements in AM0025	Applicability of the Project
The project activity involves one or a combination of the following waste treatment options for the fresh waste that in a given year would have otherwise been disposed of in a landfill: e) Incineration of fresh waste for energy generation, electricity and/or heat. The thermal energy generated is either consumed on-site	The project activity involves waste incineration treatment for MSW in Fuqing city that would have been disposed of in the Fuqing Yibadi Landfill site. Electricity generated is exported to the East China Power Grid and used internally at the project site. The incinerator is grate type.

and/or exported to a nearby facility. Electricity generated is either consumed on-site, exported to the grid or exported to a nearby facility. The incinerator is rotating fluidized bed or circulating fluidized bed or hearth or grate type.	
The waste should not be stored longer than 10 days. The waste should not be stored in conditions that would lead to anaerobic decomposition and, hence, generation of CH_4;	The waste will be stored in the waste storage pool before incineration. According to the Project FSR, the effective total volume of the waste storage pool is 11340 m^3 (L52.5m * W18m * D 12m) with the waste capacity for 0.4t/m^3, it can store about 4500 tonnes MSW per year. So the MSW could be stored for 5 days before incineration. Furthermore, the crane will convey and mix the MSW to prevent its anaerobic breakdown. Moreover, in order to avoid methane emissions and avoid odour from anaerobic decay, the incinerator will extract air from the waste storage pool. Any air discharged in the storage process will be used in the combustion process.
The proportions and characteristics of different types of organic waste processed in the project activity can be determined, in order to apply a multiphase landfill gas generation model to estimate the quantity of landfill gas that would have been generated in the absence of the project activity;	The proportions and characteristics of the MSW are included in B.6.3 of the PDD. These data are used to estimate the landfill gas generation with the multi-phase model stated in the latest version of "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site". Moreover, the proportion and characteristics are crucial data included in the monitoring plan.
The project activity may include electricity generation and/or thermal energy generation from the biogas, syngas captured, RDF/stabilized biomass produced, combustion heat generated in the incineration process, respectively, from the anaerobic digester, the gasifier, RDF/stabilized biomass combustor, and waste incinerator. The electricity can be exported to the grid and/or used internally at the project site. In the case of RDF/SB produced, the emission reductions can be claimed only for the cases where the RDF/SB used for electricity and/or thermal energy generation can be monitored;	The Project includes electricity generation from combustion heat generated in the incineration process. The electricity generated will be used on site as well as exported to the East China Power Grid. Heat recovered for thermal demand is not involved in the project.
Waste handling in the baseline scenario shows a continuation of current practice of disposing the waste in a landfill despite environmental	Waste handling in the baseline scenario of the proposed project is landfill. In China, there are no laws, regulations, or government policies that

regulation that mandates the treatment of the waste, if any, using any of the project activity treatment options mentioned above;	require the disposal of the waste through incineration[3]. Currently, 85% of the total MSW treated in China occurs at landfill sites[4].
The compliance rate of the environmental regulations during (part of) the crediting period is below 50%; if monitored compliance with the MSW rules exceeds 50%, the project activity shall receive no further credit, since the assumption that the policy is not enforced is no longer tenable;	There are no enforced environmental regulations mandating the treatment of the waste using any of the project activity treatment options mentioned above in China up until now. If the MSW rules are promulgated hereafter and monitored compliance with them exceeds 50%, the project activity shall receive no further credit.
The project activity does not involve thermal treatment process of neither industrial nor hospital waste;	The project is mainly to treat municipal solid waste in Fuqing city. There are no industrial and/or hospital waste involved in the project.
If auxiliary fossil fuel is added into the incinerator, the fraction of energy generated by auxiliary fossil fuel is no more than 50% of the total energy generated in the incinerator.	The Project does not require a constant input of auxiliary fossil fuel during the incineration process. The emissions from the use of fuels to ignite the waste at the start of the incineration process are included in the project emissions. According to FSR, annual 385 ton diesel oil will be used. The energy generated by diesel oil would be 385t/yr * 10^3 * 42652 kJ/kg=$1.64*10^{10}$kJ/yr. While the energy generated by the MSW would be 6700kJ/kg*300,000t/yr*10^3=$2.01*10^{12}$kJ/yr. Therefore, the fraction of energy generated by diesel fuel is 1% of the total energy generated in the incinerator, far less than 50%.
The methodology is not applicable to project activities that involve capture and flaring of methane from existing waste in the landfill.	The Project does not involve capturing and flaring of methane from existing waste in the landfill.

Therefore, the Project fulfils the applicability of methodology AM0025.

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

The project boundary is the site of the project activity where the waste is treated, including facilities for processing the waste, on-site electricity generation, wastewater treatment system and the landfill site. The project boundary does not include facilities for waste collection, sorting and transport to the project site. The Project is designed to generate electricity and export to the East China Power Grid, so the spatial extent of the project boundary will include all power plants connected to the East China Power Grid, which is composed of Shanghai Power Grid, Jiangsu Power Grid, Zhejiang Power Grid, Anhui Power Grid and Fujian Power Grid.

[3] Technical Guidance for Municipal Solid Waste Treatment in China. Jian Cheng [2010]61.

[4] Report for Chinese MSW Treatment and Fees Charging Status. 01/26/2007

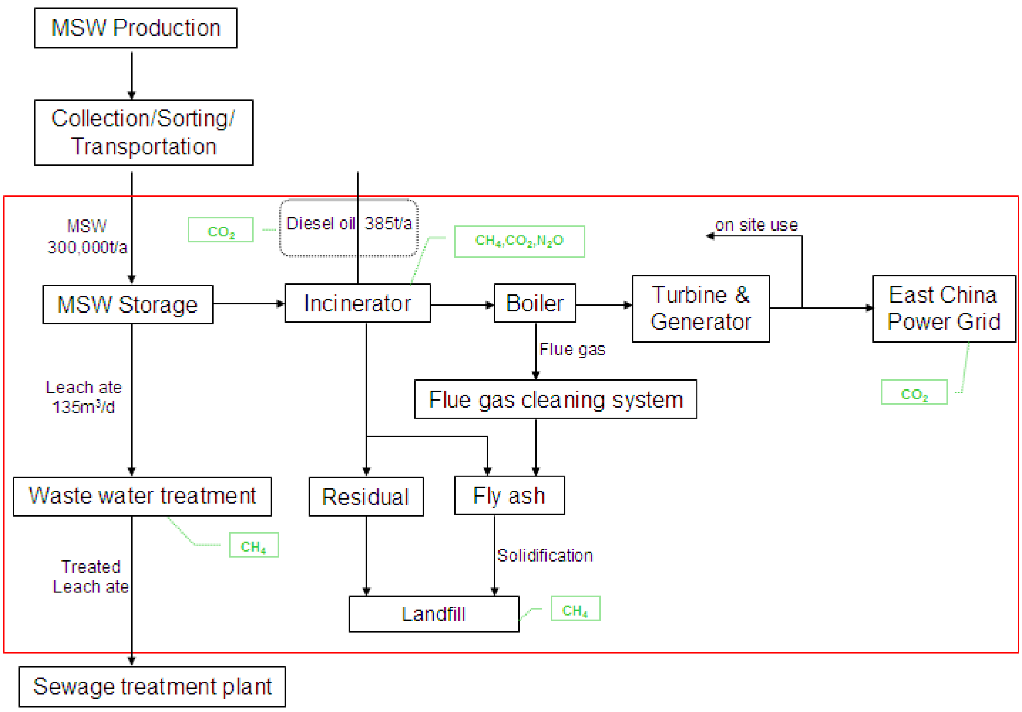

Fig B.3-1 Project Boundary

According to the methodology AM0025, the emission sources included in the project boundary are shown in Table B.3-1.

Table B.3-1 Summary of gases and sources included in the project boundary, and justification / explanation where gases and sources are not included

	Source	Gas		Justification / Explanation
Baseline	Emissions from decomposition of waste at the landfill site	CH_4	Included	The major source of emissions in the baseline
		N_2O	Excluded	N_2O emissions are small compared to CH_4 emissions from landfills. Exclusion of this gas is conservative
		CO_2	Excluded	CO_2 emissions from the decomposition of organic waste are not accounted
	Emissions from electricity consumption	CO_2	Included	Electricity may be consumed from the grid in the baseline scenario
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
Project Activity	On-site fossil fuel consumption due to the project activity other than for electricity generation	CO_2	Included	An important emission source. It includes vehicles used on-site, start up of the incinerator; diesel oil is used as auxiliary fuel in the proposed project.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small

	Source	Gas		Justification / Explanation
	Emissions from on-site electricity use	CO_2	Included	May be an important emission source. Even though the Project activity will generate electricity to be used on-site, if the electricity is imported from the grid, it will be counted as project emission.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Direct emissions from the waste treatment processes.	N_2O	Included	N_2O can be emitted from incinerator.
		CO_2	Included	CO_2 emissions from incineration shall be included. CO_2 emissions from the decomposition or combustion of organic waste are not accounted.
		CH_4	Included	CH_4 may be emitted from stacks from incineration.
	Emissions from wastewater treatment	CO_2	Excluded	CO_2 emissions from the decomposition of organic waste are not accounted
		CH_4	Included	The leachate from waste storage pool will be firstly treated by anaerobic treatment and then discharged into the waste water treatment plant. The sewage and other washing waste water will be discharge directly into the waste water treatment plant through the municipal sewage network.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small

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

According to the methodology AM0025, step 1 of the latest version of the "Tool for the demonstration and assessment of additionality (Version 06.0.0)" should be used to identify all realistic and credible baseline alternatives.

Step 1: identification of alternative scenarios.

The proposed project is composed of MSW treatment and power generation. Heat recovered for thermal demand is not involved in the project. The detail alternatives for the proposed project are as follows:

For the disposal/treatment of the fresh waste in the absence of the project activity, i.e. the scenario relevant for estimating baseline methane emissions, to be analyzed should include, *inter alia*:

M1. The project activity, incineration of waste, not implemented as a CDM project;

M2. Disposal of the waste at a landfill where landfill gas captured is flared;

M3. Disposal of the waste at a landfill without the capture of landfill gas.

For M1, MSW incineration is in compliance with all applicable legal and regulatory requirements. It corresponds to the functions of this Project without CDM.

For M2, "Municipal solid waste sanitary landfill technical standard (CJJ17-2004)" states as follows:

"Landfill site shall install effective landfill gas venting system. The passive gathering and transferring of landfill gas must be forbidden to prevent fire and explosion. In the case of no condition to utilize landfill gas, the landfill gas generated should be vented positively and flared collectively. The existing landfill gas sites which can't reach safe and stable status shall install effective landfill gas venting system and treatment facility."

However, at the same time, according to the "Report for Chinese MSW Treatment and Fees Charging Status"[5], issued by the Chinese Development and Reform Commission, only less than 3% of landfill sites have landfill gas recovery and utilization systems due to the financial and technical constraints. Considering the current practise, the legal or regulatory requirements of Technical code for municipal solid waste sanitary landfill (CJJ17-2004) is not systematically enforced and that non-compliance with this standard is widespread in China.

In December 2005, the document "Promoting Methane Recovery and Utilization from Mixed Municipal Refuse in China, Terminal Evaluation Report"[6] stated:
"At present, in China the municipal refuse is disposed of by using the technology of traditional landfill, without consideration of recovery and utilization of landfill methane. It is estimated that the annual quantity of municipal refuse filled is about 50 million tons. Almost all landfills are not equipped with the system of landfill gas recovery, except several new built landfills, and the landfill methane is emitted to the atmosphere openly."

Moreover, in February 2007, the Ministry of Construction issued the "Circular on the Outcome of Nationwide Inspection on Hazard-free Treatment of Domestic Waste Landfill Sites"[7]. As per this Circular, by the end of year 2005, 372 landfills existed across 31 provinces, autonomous regions and municipalities in China. 92.76% of the 372 landfills had no landfill gas recovery and utilization facilities.

Furthermore, "China Development Report on Disposal Industry of Urban Domestic Refuse in 2009"[8] says that there were 407 domestic landfill sites in China by the end of 2008. However, the LFG of only 25 domestic landfill sites was flared or utilized by the end of 2009, 14 of which were developed as CDM projects. Thus, less than 2.7% landfill sites (excluding the landfill sites related with CDM projects) in China flare or utilize LFG by the end of 2009.

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[5] http://www.ndrc.gov.cn/jggl/jgqk/t20070126_113814.htm

[6] "Promoting Methane Recovery and Utilization from Mixed Municipal Refuse in China, Termial Education Report" submitted to Development Programme & Department of Economic and Social Affairs of the United Nations and State Environmental Protection Administration of the People's Republic of China in December 2005.

Reference: http://erc.undp.org/evaluationadmin/downloaddocument.html?docid=558

[7] http://www.huanke.com.cn/08/article.asp?articleid=416

[8] "China Development Report on Disposal Industry of Urban Domestic Refuse in 2009", published in China Environmental Protection Industry in July 2010, Disposal Committee of Urban Domestic Refuse, CAEPI, Beijing 100037, China"

Therefore, it is a fact that prevailing LFG treatment in China is far behind the requirements of the above mentioned regulations and alternative 2 is not applicable.

Alternative M3 represents the current situation, the continued disposal of waste at the local landfill site without landfill gas capture and utilization, and is therefore considered as a realistic and feasible alternative scenario to the project activity.

Conclusion: We conclude that Alternative M1, proposed project activity is not implemented as a CDM project and M3 disposal of the waste at a landfill site without the capture of landfill gas are the most realistic and feasible alternative baseline scenario for the disposal and treatment of waste.

For power generation in the absence of the project, the alternatives may include:

P1. Power generated from by-product of one of the options of waste treatment as listed in M1 above, not undertaken as a CDM project activity;

P2. Existing or Construction of a new on-site or off-site fossil fuel fired cogeneration plant;

P3. Existing or Construction of a new on-site or off-site renewable based cogeneration plant;

P4. Existing or Construction of a new on-site or off-site fossil fuel fired captive power plant;

P5. Existing or Construction of a new on-site or off-site renewable based captive power plant; or

P6. Existing and/or new grid-connected power plants.

For P1, power generated from incineration consistent with all applicable legal and regulatory requirements. It corresponds to the functions of this Project without CDM.

For P2 and P3, cogeneration plant is not the realistic scenario as the proposed project only recovers combustion heat for electricity generation, without providing heat for on-site use or nearby facilities. Therefore, alternative P2 and P3 are not the baseline scenarios to the project.

For P4, firstly, there is no existing fossil fuel fired captive power plant at the project site. Secondly, the MSW incineration plant consumes only a small amount of electricity and the electricity produced by the Project is primarily for sale to the local grid, rather than for captive use. Furthermore, according to the *Notice on strictly prohibiting the installation of the fuel-fired generators with the capacity of 135 MW or below*[9] issued by State Council, 2002, thermal power plants of less than 135 MW are prohibited for construction in the areas covered by regional grids. Therefore, construction of a new on-site or off-site fossil fuel fired captive power plant with the same generation capacity 18MW as the Project, is not in compliance with Chinese regulations on construction of a thermal plant. It is not the baseline scenario to the Project.

For P5, other possible grid-connected renewable energy technologies, such as solar PV, geothermal, wind and hydro power, can also be applied in China. However, the exiting situation remains some disadvantages for some renewable energy technologies referred to above. According to the *Distributing of*

[9] http://www.gov.cn/gongbao/content/2002/content_61480.htm

solar PV resource[10] and *Distributing and utilization of geothermal generation resource*[11] in China, the solar PV resource and geothermal generation resource are not suitable to build power plants in Fuqing City. Furthermore, the solar PV[12] and geothermal power generation[13] face technical barriers and are difficult to operate without specialist experience and extensive financial support. The distribution of wind sources in Fujian province is serious disproportion, almost all technical exploitation amount centralize in islands and peninsulas of Fujian province[14]. Where the project located is the inland city and unfit for developing wind power projects. The water resources are shortage in Fuqing city[15], so the hydro power is also not fit. Therefore, the P5 is not a realistic alternative.

In the absence of the project activity, Alternative P6 is the most likely scenario: the existing and new grid-connected power plants would supply electricity.

The Project does not involve heat generation; therefore, baseline scenarios H1-H9 are not applicable.

Conclusion: We conclude that alternative P1, proposed project activity is not undertaken as a CDM project activity, and alternative P6, purchase of equivalent electricity from the East China Power Grid, are the most plausible baseline scenario for the supply of power.

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

As analysed above only P1 and P6 involve fuel identification.

For P1, concerning waste treatment, the daily supply of MSW that will be processed through incineration is secured in a contract signed by the local authority and project owner. It is estimated that the amount of MSW will increase progressively with the development of Fuqing economic and urban construction. Therefore, there is no constraint for the MSW supply.

For P6, the purchase of an equivalent amount of electricity from the East China Power Grid, the fuel consumption for electric power generation on the ECPG is shown in Annex 3, which reflects the availability of the baseline fuel. There is no fuel supply constraint.

Step 3: Step 2 and/or Step 3 of the latest approved version of the "Tool for demonstration and assessment of additionality" shall be used to assess which of these alternatives should be excluded from further consideration (e.g. alternatives facing prohibitive barriers or those clearly economically unattractive).

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[10] http://cwera.cma.gov.cn/upload/b_3_left_02.jpg

[11] http://news.bjx.com.cn/html/20120313/347598-2.shtml

[12] http://www.in-en.com/newenergy/html/newenergy-1648164866133543.html

[13] http://www.newenergy.org.cn/html/01012/12201037823.html

[14] http://www.chinaste.net/info/detail/16-15923.html

[15] The Current Situation, Problems and Countermeasures of Water Recourses in Fuqing City. *Hydranlic Science and Technology*. 1999. S1.

Step 2, investment analysis, of the latest approved version of the *Tool for demonstration and assessment of additionality* is used for the Project. The details of the investment analysis provided in section B.5 shows that M1 and P1 face investment barriers and are excluded from further consideration as a baseline scenario.

Step 4: Where more than one credible and plausible alternative remains, project participants shall, as a conservative assumption, use the alternative baseline scenario that results in the lowest baseline emissions as the most likely baseline scenario.

Not applicable since there is only one alternative scenario.

In conclusion the baseline scenario of this Project is the combined scenario of M3 and P6 shown following:

Table B.3-2 The baseline scenario of the Project

Scenario	**Baseline options**		**Description of situation**
	Waste	Power	
1	M3	P6	The disposal of the waste in a landfill site without capturing landfill gas. Purchasing the equivalent electricity from the East China Power Grid.

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

Following steps are cited to demonstrate the additionality for this Project according to the *Tool for the Demonstration and Assessment of Additionality* (Ver.06.0.0) as required by the methodology:

Consideration CDM prior to starting project activity

The Investment Intension Agreement was signed on June 20th 2008 between Fuqing City Management Bureau and the project developer, which was the draft agreement before formal BOT contract, where the total amount of MSW disposal treatment and the waste disposal cost were specified. Based on Investment Intension Agreement, the Environmental Impact Assessment Report (EIA) and the Feasibility Study Report (FSR) of the Project was completed on October and November 2008 respectively. The EIA report confirmed that the location of the Project was reasonable and had no environmental impact, while the financial indicator of investment in the FSR shows that the project IRR was lower than the benchmark 8%, so the design organization of FSR advised the project developer consider CDM applying to improve the financial attractiveness. After considering the results of both EIA and FSR, which confirmed that the proposed project complied with all national and local environmental protection regulations and was financial feasible with consideration of CDM, the formal BOT contract was finally signed on May 22nd 2009 between Fuqing City Management Bureau and the project developer which ruled that the Project should be built, operated by the project owner, and transferred to Fuqing City Management Bureau after 25 years operation period (including 2 years' construction period) without any compensation. As per the

"Regulation on the BOT investment in the utilities sector[16]" stipulated by the Ministry of Construction of China in May 2004, for BOT project in China, the BOT contract is one of prerequisites for the project approval by the Chinese government. Thus, only after the formal signed BOT contract, the Project can be approved by Fujian Environmental Protection Bureau on June 16th 2009 and Fujian Provincial DRC on July 25th 2009. Then, after these governmental approvals, the project developer gained the legal right to seek for the land permit, permission of electricity interconnection to the grid and the construction of the project. Therefore, the BOT contract is fully in compliance with the national regulation on investment in the utilities sector in China and cannot be enforced to commit the project developer to the project implementation before further approval granted by Chinese relevant government authorities. Since the BOT contract should be one of the documents indispensable to go through the project feasibility approval in the Chinese regulation context, the signature of the BOT contract cannot be considered as a starting date of the project.

After the legal necessary documents, such as the BOT contract, the approvals for EIA and FSR reports, were gained, the project developer decided to construct the project with consideration of CDM through board meeting on August 2009 to improve the financial attractiveness and then signed the consultant agreement with Hang Zhou Carbon Tread Environment Engineering Co., Ltd (HZCTEE) on October 16th 2009.

The Engineering Procurement and Construction contract (EPC contract) of the Project was signed on July 3rd 2010 between New Sky Engineering and the project owner which was the earliest date the project began and therefore determined as the starting date of the Project. The EPC contract was signed with the intension that the project owner agreed all the construction work from design, equipments purchase and civil construction to the final commissioning operation can be outsourced to New Sky Engineering. After the EPC contract signed on July 3rd 2010, the construction contract of the Project was formal signed with Zhejiang Provincial Erjian Construction Group LTD on July 15th 2010 to start civil work. The project owner then proceeded to secure the CDM application for the project. In accordance with the "Guidelines on the demonstration and assessment of prior consideration of the CDM", the project owner submitted the notification of CDM consideration to Chinese DNA and CDM EB on November 20th 2010 and December 24th 2010 respectively.

The main events relating to the project is illustrated by table below:

Table B.5-1 The main events of the Project

Date	Key events
20/06/2008	The Investment Intension Agreement signed between Fuqing City Management Bureau and the project developer
10/2008	Environmental Impact Assessment (EIA) report completed
11/2008	Feasibility Study Report (FSR) completed
22/05/2009	The formal BOT contract signed between Fuqing City Management Bureau and the project developer
16/06/2009	The EIA Approval from Fujian Environmental Protection

[16] http://www.kingandwood.com/article.aspx?id=Banking-Finance-for-Waste-to-Energy-Projects&language=zh-cn

	Bureau
25/07/2009	The FSR Approval from Fujian Provincial DRC.
20/08/2009	Decided to apply for CDM project through Directorate Resolution.
16/10/2009	CDM consultancy agreement signed by project owner with HZCTEE.
21/02/2010	The project owner took the stakeholder meeting.
03/07/2010	The Project started (EPC contract signed)
15/07/2010	The construction contract signed
20/11/2010	NDRC notification for the Project.
24/12/2010	EB notification for the Project.
18/02/2011	ERPA signed by the project owner and the buyer.

Prohibitive barriers that the Project activity faces are clearly identified using the *Tool for the demonstration and assessment of additionality (version 06.0.0)*. The following steps from the additionality tool are completed below:

STEP 1 – Identification of alternatives to the project activity consistent with current laws and regulations

STEP 2 – Investment analysis

STEP 3 – Barriers analysis

STEP 4 – Common practice analysis

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

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

As described above, the proposed project is composed of MSW treatment through waste incineration and subsequent power generation. The detailed alternatives for the proposed project are as follows:

For the disposal/treatment of the fresh waste in the absence of the project activity, i.e. the scenario relevant for estimating baseline methane emissions includes, *inter alia*:

M1. The project activity, incineration of waste, not implemented as a CDM project;

M2. Disposal of the waste at a landfill where landfill gas captured is flared;

M3. Disposal of the waste on a landfill without the capture of landfill gas.

For power generation in the absence of the project, the alternatives may include:

P1. Power generated from by-product of one of the options of waste treatment as listed in M1 above, not undertaken as a CDM project activity;

P2. Existing or Construction of a new on-site or off-site fossil fuel fired cogeneration plant;

P3. Existing or Construction of a new on-site or off-site renewable based cogeneration plant;

P4. Existing or Construction of a new on-site or off-site fossil fuel fired captive power plant;

P5. Existing or Construction of a new on-site or off-site renewable based captive power plant;

P6. Existing and/or new grid-connected power plants.

Based on the baseline scenario discussion in Section B.4, We conclude that alternative M1, proposed project activity is not undertaken as a CDM project activity and M3, disposal of the waste on a landfill without the capture of landfill gas are the most plausible baseline scenario for the use of waste incineration available since it corresponds to pre-existing practice and complies with all legal and regulatory requirements. Alternative P1, proposed project activity is not undertaken as a CDM project activity and alternative P6, purchase of equivalent electricity from the East China Power Grid, are the most plausible baseline scenario for the supply of power.

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

There is no existing fossil fuel fired captive power plant in the project site and the MSW incineration plant consumes only a small amount of electricity and the electricity produced by the Project is primarily for sale to the local grid, rather than for captive use. Furthermore, according to *Notice on strictly prohibiting the installation of the fuel-fired generators with the capacity of 135 MW or below* issued by State Council, 2002, thermal power plants of less than 135 MW are prohibited for construction in the areas covered by regional grids. Therefore, construction of a new on-site or off-site fossil fuel fired captive power plant with the same generation capacity 18MW as the Project, is not in compliance with Chinese regulations on construction of a thermal plant. It is not the baseline scenario to the Project.

As described above, only alternatives M1, M3, P1 and P6 are in compliance with all mandatory applicable legal and regulatory requirements.

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method

According to the methodology for the determination of additionality, the Project must select three of the alternative methodologies for financial analysis. The alternative methodologies for financial are simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

Option I - Simple Cost Analysis - Since the Project will receive additional revenues from the sale of the generated electricity, the simple cost analysis is not applicable.

Option II - Investment Comparison Analysis - The baseline scenario, a combination of alternative scenarios M3 & P6, is the continuation of electricity supply from the existing East China Power Grid to meet the electricity demand rather than investment in a new project to provide power. Thus, the investment comparison analysis is excluded.

Option III – Benchmark Analysis - This method is adopted based on the returns of the investment in the Project in comparison to benchmark returns that are available to other projects.

Sub-step 2b. Option III Apply Benchmark Analysis

With reference to *Methods and Parameters for Economical Appraisal for Construction Project* [17]jointly issued by the National Development & Reform Commission and the Ministry of Construction of China in 2006, the financial benchmark IRR for MSW-based power generation in China is 8% (after tax). This minimum IRR is of total investment and is a widely accepted standard for projects in the power industry. Many of China's power projects apply this benchmark IRR for financial assessment and use it as a hurdle rate for investment in the power industry such as wind power projects, hydropower projects, waste incineration projects, etc.

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

Basic data and assumptions for the calculation of the financial indicator of the Project are summarized in Table B.5-2.

Table B.5-2 Main Parameters for the Financial Analysis of the Project

Parameters	Value	Source
Waste treatment capacity	300,000 t/yr	Feasibility Study Report (FSR)
Installed Capacity	18MW	FSR
Total Investment	440.77 Million CNY	FSR
Average annual operational and maintenance costs	31.37 Million CNY	FSR
Annual Net Output	87,703 MWh	FSR
Operational hour per year	8000 hr/yr	FSR
Waste disposal costs	61.5CNY/t	FSR
Electricity Tariff (include VAT)	0.364CNY/kwh	FSR
Electricity subsidy(include VAT)	0.25 CNY/kwh (for the first 15 operational years)	FSR
Value Added Tax	17%	FSR
City construction maintenance tax	7%	FSR
Educational added tax	3%	FSR

[17] Methods and Parameters for Economical Appraisal for Construction Project (version 3) National Development & Reform Committee and the Ministry of Construction, 2006

Income Tax	25%	FSR
Project operational lifetime	23 year	FSR
Expected CERs price	8 Euro/tCO_2	ERPA

The basic parameters of the Project are from FSR designed by China Urban Construction Design & Research Institute. And the main elements such as waste treatment capacity, waste disposal cost, electricity tariff and electricity subsidy can be cross-checked with related contracts and national regulations.

The Project is BOT project. According to the contract signed between the project developer and Fuqing City Management Bureau for 25 years, waste treatment capacity and waste disposal cost of the Project are all fixed during the project lifespan.

The electricity tariff is regulated by National Development and Reform of China, according to the Notification on the Adjustment of on-grid tariffs for the East China Power Grid[18], the electricity tariff in Fujian province is 0.364 RMB/kwh. With reference to "The Tentative Management Measures for Renewable Power Pricing and Cost Sharing[19]", the waste incineration power generation project in China, belonged to biomass power projects, could enjoy the subsidy electricity tariff for 15 years since operation. The subsidy electricity tariff is 0.25 RMB/kwh; it will be cancelled for the rest operational lifetime. Thus, the electricity tariff is estimated at 0.614 RMB/kwh for the first 15 years and 0.364 RBM/kwh for the rest 8 operational years.

As described above, the input values of the FSR used in this financial analysis are confirmed reliable and conservative in the real circumstances of the Project. The IRR analysis is showed below.

Table B.5-3 Project IRR with and without the revenue of CERs

	Without CERs	With CERs
IRR	4.91%	8.17%

Table B.5-3 shows the project IRR with and without the revenue of CERs. Without the revenue of CERs, the project IRR is 4.91% which is clearly lower than the financial benchmark of 8%. Thus the Project is not considered to be financially viable under business as usual conditions.

However, taking into account the CDM revenues, the project IRR increases up to 8.17%, which is higher than the financial benchmark. Therefore the CDM revenues would improve the economic feasibility of the Project.

Sub-step 2d. Sensitivity analysis

The sensitivity analysis shall show whether the conclusion regarding financial attractiveness is robust or not to reasonable variations in the critical assumptions.

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[18] http://www.sdpc.gov.cn/jggl/jggs/t20060630_129587.htm

[19] http://www.gov.cn/ztzl/2006-01/20/content_165910.htm

Following key parameters have been selected as sensitive indicators to test the financial attractiveness for the Project.

(1) Total investment;

(2) Operation & maintenance (O&M) costs

(3) Waste disposal charge

(4) Annual electricity exported to the grid

(5) Electricity tariff

Firstly, the effect of changes in the fixed asset investments, O&M costs, waste disposal charge, electricity delivered to the grid and electricity tariff are examined on the internal return rate (IRR). The five parameters are varied in ranges of ±10% which in compliance with the Chinese requirements and variations of ±10% have been used in this PDD for conservative purpose. The resulting IRRs are presented in Table B.5-4.

Table B.5-4 IRR of total investment sensitivity to different financial parameters of the Project (Without CDM)

Parameter	Range				
	-10%	-5%	0	5%	10%
Total investment	5.79%	5.32%	4.91%	4.57%	4.24%
O&M costs	5.70%	5.32%	4.91%	4.50%	4.07%
MSW disposal charge	4.42%	4.67%	4.91%	5.15%	5.39%
Annual electricity exported to the grid	3.64%	4.30%	4.91%	5.52%	6.10%
Electricity tariff	3.64%	4.30%	4.91%	5.52%	6.10%

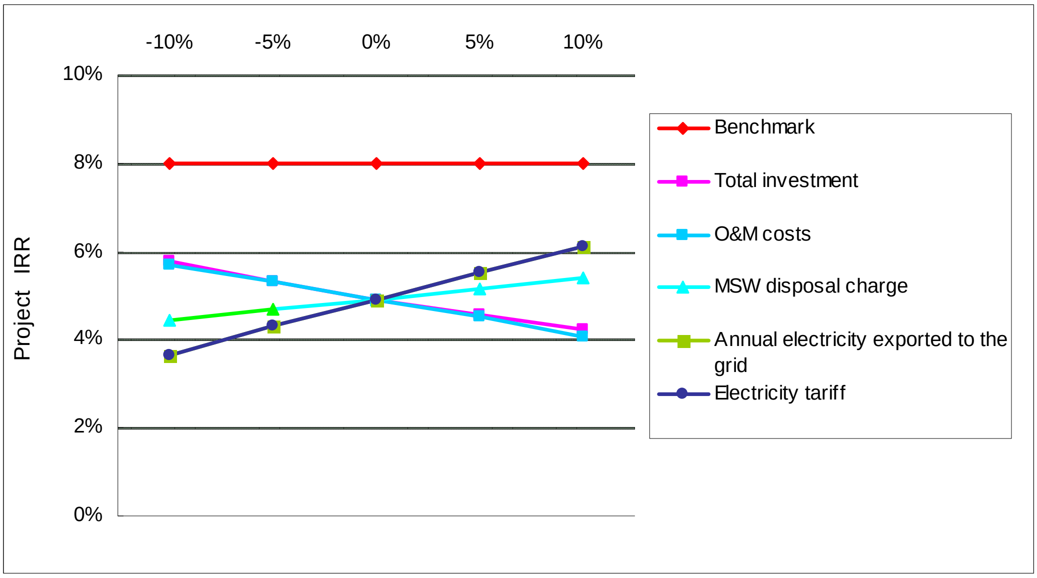

Fig B.5-1 Sensitivity Analysis of the Project

The sensitivity analysis results show that if the indicators range from -10% to 10%, the Project IRR is always lower than the financial benchmark of 8%. Thus the Project lacks financial attractiveness without CER revenues.

Alternatively, when the Project IRR is equal to the benchmark 8%, the results changes to the sensitive indicators is listed in the table below.

Table B.5-5 Sensitive indicator changes when the Project IRR is equal to the benchmark

Indicators	Changes	Project IRR
Total investment	-28.55%	8%
O&M costs	-43.10%	
MSW disposal charge	73.20%	
Annual electricity exported to the grid	27.50%	
Electricity tariff	27.50%	

The result of above table shows that in order to make the Project IRR reach the benchmark 8%,construction investment would need to decrease by 28.55%, or operation and maintenance costs reduce by 43.10%, or MSW disposal charge increases by 73.20%, or electricity delivered to the grid or the electricity tariff increase by 27.50%, respectively. However, none of these scenarios are likely.

Total investment decreasing by 28.55% is impossible to occur, because during the project construction investment in equipment, material etc will increase. It is therefore impossible to improve the financial attractiveness by decreasing investment in fixed assets.

Operation and maintenance costs are unlikely to decrease by 43.10% due to ongoing increases in material and labour costs, etc. in the Fujian province where the Project is located. According to the Fujian Provincial Bureau of Statistics, the procurement price index for material, fuel and power increased by 3.9%, 4.3%, 10.2% and -6.8% and the salary index increased by 10.4%, 10.1%, 10.8% and 10.9%, respectively, during 2006[20], 2007[21], 2008[22] and 2009[23]. Although price index for material, fuel and power decreased by 6.8% in 2009, the Project IRR would still not reach the benchmark 8%.

As for the MSW disposal charge, the Project owner and the local government had signed the waste disposal charge agreement; the price is fixed in the contract and won't be changed during the project's operating period without the mutual negotiation and agreement from the parties to that agreement. Therefore, the MSW disposal charge increase of 73.20% is unlikely to occur.

If the annual electricity exported to the grid increased 27.50%, the project IRR would be equal to the benchmark 8%. However, this is impossible because the electricity generated is influenced by the amount of waste processed, waste heating value and the thermal efficiency of waste heat utilization. Since the annual volume of waste delivered to the plant is fixed in the agreement signed by the project owner and local government, so the amount of waste processed is unlikely to fluctuate during the operation period. The designed LHV is 6700KJ/kg[24] and the operation load factor range is 70%-110%. The maximum continuous rate (MCR) of the boiler is strictly designed according to the designed LHV and the evolution and fluctuation of LHV of waste have already taken into consideration in the calculation of electricity output. The thermal efficiency of waste heat utilization is nearly 20.4%, which is the optimum efficiency of the electric generation system under the designed LHV. Therefore, a significant increase by 27.5% in the annual electricity exported to the grid is unlikely to occur.

The electricity tariff would need to increase 27.50% to reach the benchmark IRR of 8%. This scenario is unlikely because the tariff for power-generating projects that export to the grid in China is strictly regulated by the government and once set does not fluctuate significantly.

According to the sensitivity analysis above, within the reasonable range of each parameter, the IRR of the Project is always lower than the investment benchmark. Thus the Project lacks the financial attractiveness without the CER revenues. It can be therefore concluded that M1, P1 are not feasible baseline alternatives.

However, if the Project could be successfully registered as a CDM project, taking into account the CER revenues at 8.0 Euro /tCO_2 (10 years x 1 crediting period), the IRR of the Project will reached up to 8.17% which is significantly improved to meet the benchmark level.

Step 3. Barrier Analysis

According to the "Tool for Demonstration and Assessment of Additionality" (version 06.0.0), Step 3 is not used for the Project activity.

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[20] http://www.stats-fj.gov.cn/tjgb/0200702260074.htm

[21] http://www.stats-fj.gov.cn/tjgb/0200802270025.htm

[22] http://www.stats-fj.gov.cn/tjgb/0200902270086.htm

[23] http://www.stats-fj.gov.cn/tjgb/0201002250012.htm

[24] The technical contract of incinerator

Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity:

According to the paragraph 6 of "Tool for Demonstration and Assessment of Additionality" (version 06.0.0):

Measure *(for emission reduction activities) is a broad class of greenhouse gas emission reduction activities possessing common features. Four types of measures are currently covered in the framework:*

(a) Fuel and feedstock switch;
(b) Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies);
(c) Methane destruction;
(d) Methane formation avoidance.

The MSW incineration project belongs to the type (d) of *measure*:

The MSW incineration for energy generation that would have been disposed of in the landfill site without the capture of landfill gas, the measure prevents the formation of methane.

According to the paragraph 47 of "Tool for the Demonstration and Assessment of Additionality" (version 06.0.0), "*for measures that are listed in paragraph 6*", this part should analysis in the following:

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

The applicable output range as+/-50% of the design capacity 18MW of the proposed project activity is from 9MW to 27MW.

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

Determination of the applicable geographical area:

According to the "Technical Guidance for Municipal Solid Waste Treatment (Jiancheng [2010] No.61)"[25] and "Construction Standard for Municipal Solid Waste Treatment Project (Jianbiao [2001] No.203)"[26], local resident aggregation, land resources, economic development, properties and characters of waste

[25] http://www.mep.gov.cn/gkml/hbb/gwy/201005/t20100520_189724.htm
Technical Guidance for Municipal Solid Waste Treatment (Jiancheng [2010] No.61) issued by National Ministry of Housing and Urban-Rural Development, National NDRC and National Environmental Protection Bureau on 22/04/2010.

[26] http://tzs.ndrc.gov.cn/tzfg/zhxfg/W020090218549418460426.pdf
Construction Standard for Municipal Solid Waste Treatment Project (Jianbiao [2001] No.203) issued by Ministry of Construction and State Development Planning Commission on 23/10/2001

should be fully considered for the choice of municipal solid waste (MSW) treatment technology in China. Currently, landfill is the prevailing treatment of MSW in China. IPCC statistics show that only 2% of the total amount of municipal solid waste is incinerated in China[27]. This shows that incineration of fresh MSW for energy production is not the prevailing practice in China.

As per the "Tool for Demonstration and Assessment of Additionality" (version 06.0.0), i) *the* ***applicable geographical area*** *covers the entire host country as a default. If technologies vary considerably from location to location depending on local conditions, then the applicable geographic area could be smaller than the host country;* ii) *the Projects are considered* ***'similar'*** *in case they are located in the 'same country/region', are of 'similar scale', and 'take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc.'*

China is a large country where the *local conditions*, such as *regulatory framework, investment climate, access to technology, etc.* vary considerably especially between the different provinces. These *local conditions* have great impact on the selection of incineration technology. Thus, for the *similar incineration projects* as the proposed project, the *same region* (here defined as same province) is selected as the *applicable geographic area*, for the environment with respect to economic development level, characters of waste *(access to technology),* environmental policy and regulations *(regulatory framework),* the electricity tariff and the MSW disposal cost *(investment climate), etc.* are more comparable under provincial level than the whole country level, i.e. China.

The following analysis clearly demonstrates the variation of *local conditions* that have great impact on the incineration technology among provinces and provides justification on the provincial level is the applicable geographic area for common practice analysis of the proposed CDM project.

1) Economic development level

Due to the complicated technology, the strict requirements for operators and supervision, and the comparable high construction investment and O&M costs[28], the prerequisite for selection of incineration technology is economic development level. In China, the economic development level varied considerably from province to province. According to the China Statistical Yearbook 2010[29], the financial revenue of Zhejiang, Guangdong and Jiangsu province are listed in top three in 2009, correspondingly, these provinces have the top three number of incineration plants in 2009, which are 21, 17 and 14 respectively, medium-developed areas such as Fujian, Shandong provinces, have 4-6 incineration plants and most other provinces have 1 or 2 incineration plants and some undeveloped provinces such as Inner Mongolia, Guizhou, Xizang, Xinjiang and Ningxia have no incineration plants recorded. Thus, the incineration technology is not applicable all over China due to the unbalanced economic development level; it is mainly distributed in developed provinces.

2) Characters of waste

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[27] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 2: Waste generation, Composition and Management data, p17 Annex 2A.1

http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf

[28] http://www.mep.gov.cn/gkml/hbb/gwy/201005/t20100520_189724.htm

[29] China Statistical Yearbook 2010.

The characters of waste, such as the properties, the heat value of waste and the amount of waste, are influenced by geographic condition, the economic development level, and the consumption level and structure, as well as the fuel structure which vary from province to province[30]. In some coal-fired heating area of China, such as Gansu province, the coal cinder and the ash content contained in the MSW is higher than that in no coal-fired heating area, thus the heat value of waste is comparable low[31], and the incineration technology is thus not suitable. Moreover, if the ash content is too high, the treatment for fly ash, residual and smoke generated during the incineration process will be more complicated and cause higher investment. The amount of waste generated will impact the treatment capacity of incineration technology. In China, the incineration treatment capacity in north area is lower than that in south area[32]. To conclude, the characters of waste which vary from province to province have affect on applicability of incinerator technology, and on the selection of type and capacity of incinerators, as well as the treatment method of fly ash, residual and smoke generated in the process of incineration.

3) Incinerator type

Incinerator is the most important equipment for incineration technology. According to the research on "The Current Situation and Estimation on Incineration Technology in China"[33], issued by Environmental Sanitation Engineering Technology Research Center of National Ministry of Construction, there are three main type of incinerators in China, which are grate type incinerator, fluidized bed incinerator and other (include small type vertical furnace, small type chain boiler and pyrolyzing furnace), the numbers of incineration plants using these three technology account 40%, 38% and 22% respectively in China, because the treatment capacity of the other type of incinerators (including small type vertical furnace, small type chain boiler and pyrolyzing furnace) is small (100-200 t/d), and the technologies are mostly focus on incineration waste but not involve electricity generation, these kind type of incinerators are usually used as simple auxiliary waste treatment facilities in certain landfill sites, thus, grate type incinerator and fluidized bed incinerator as mentioned above are the most widely used incinerator type in China. As the investment cost of grate type incinerator is comparable higher and the largest unit treatment capacity can amount to 1200 t/d[34], it is mainly distributed in developed and waste abundant area, such as Zhejiang, Jiangsu, and Guangdong province. The fluidized bed incinerator is mainly domestic manufactured and has lower investment cost, its unit treatment capacity amounts to 500 t/d and it needs coal as auxiliary fuel during the incineration process, thus, application of this technology is mainly

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[30] http://gongyi.cn.yahoo.com/ypen/20110630/443515_1.html

Current Situation and Strategy of MSW Treatment in China.

[31] Analysis of Components and Treatment Methods of Domestic Waste in China, published on Chinese professional journal-Environment Sanitation Engineering.

[32] China Statistical Yearbook 2010, item 12 (Resource and Environment).

[33] http://www.chinaenvironment.com/view/ViewNews.aspx?k=20071220171205375

The Current Situation and Estimation of Incineration Technology in China, issued by Environmental Sanitation Engineering Technology Research Centre of National Ministry of Construction.

[34] Municipal Domestic Waste Incineration Technology and Application, published on the Chinese professional journal-Energy Conservation Technology.

concentrated in heat needed and developing area, such as Shandong, Henan and Hebei provinces[35]. Thus, also in the provinces which have suitable condition for MSW incineration technology, the incinerator type is another influenced factor.

4) Environmental policy and regulation

The pollutant emissions generated during the incineration process must strictly comply with the national and local environmental policies and regulations which are established on the basis of environment capacity (which is defined as the largest capacity to contain pollutants in certain environment, such as water environment, air environment and so on) in each province. In China, the environment capacities vary considerably across whole country due to the different industrial structure and economic development levels, as well as the basement environment level, thus the pollutant emission load and the requirements for pollutant treatment degree are different from province to province.

Take leachate as example, according to the China Water Environment Capacity Shortage Degree (COD index) Research[36], the water environment capacity in Jiangsu, Shanghai and Anhui is almost exhausted, thus, the water pollutant emission must be controlled to the lowest, the leachate treatment during the incineration process should reach to the first level of national standard which will install better leachate treatment facilities, cause higher investment; while, the water environment capacity in Zhejiang, Fujian and Guangdong is enough, the leachate treatment just need to reach to the third level of national standard which is lower than first level. Therefore, the environment policy and regulations on the pollutant emission generated during the incineration process are quite different from province to province due to the different environment capacity, which will influence the selection of environment protection method of incineration technology.

5) Electricity tariff and the MSW disposal cost

In China, the economic development levels, the industrial structure, the fundamental infrastructure, development strategy and policy framework vary from province to province which will impact the electricity tariff and the MSW disposal cost of incineration technology. As per the "The Tentative Management Measures for Renewable Power Pricing and Cost Sharing[37]" (which is the main reference document for renewable power price), the electricity tariff for MSW incineration projects is based on the benchmark tariff of coal-fired desulfurization plants' in the Province where the project is located. The benchmark tariffs vary significantly among provinces. For example, the electricity tariff in Zhejiang province is 0.4045 CNY/kwh, in Jiangsu province is 0.375 CNY/kwh, in Fujian province is 0.364 CNY/kwh, and in Shanghai is 0.4004 CNY/kwh[38]. The MSW disposal cost is also vary from province to

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[35] Current Development Situation and Prospect of Circulating Fluidized Bed Technology, published on the Chinese professional journal-Power Engineering.

[36] The Research on China Water Environment Capacity, published on Chinese professional journal-China Environmental Science.

[37] http://www.gov.cn/ztzl/2006-01/20/content_165910.htm

[38] http://www.ndrc.gov.cn/zcfb/zcfbtz/tz2006/t20060630_75077.htm

For all incineration projects, electricity tariff is composed of benchmark electricity tariff under provincial level where project located and the same subsidy tariff 0.25 CNY/kwh for 15 years since operation (which is explained clearly under the Table B.5-2 of this PDD). The electricity tariff listed here does not include the electricity subsidy

province due to the different policy and the economic development level, commonly, the more developed of economic, the higher of the MSW disposal cost, for example, the MSW disposal cost in Fuqing city, Fujian province is 61.5 CNY/t[39], in Ningbo city, Zhejiang province is 193 CNY/t[40], in Shanghai is 240 CNY/t, and in Guangzhou city, Guangdong province it is 200 CNY/t[41]. Furthermore, the tariff rates of products, the cost of materials and other utilities such as water, the cost of labour and services and the types of loan that can be obtained vary considerably from province to province, which also have great impact on the investment cost of incineration plants. Thus, the investment climates vary significantly among provinces in China and the provincial level is the more comparable environment.

As analysed above, China is a large country where the economic development levels, the geographic condition, the industrial structure, the fundamental infrastructure, and regulatory framework such as environment policy and regulations are different from province to province, due to the complicated technology of incineration, not every province can access to the technology, thus the incineration technology is not applicable to the whole China, and for provinces which have suitable condition for MSW incineration technology, the characters of waste, the incinerator type and the investment climate are also different from province to province, thus, the incineration technology varies from province to province in China depending on the local conditions listed above, as per the "Tool for Demonstration and Assessment of Additionality" (version 06.0.0), the most applicable geographical area for the common practice analysis of the proposed project is not the whole country, but Fujian province where the proposed project is located should be chose.

Identification of all plants that deliver the same output or capacity:

For the proposed project, those projects that (i) are located in Fujian province (where the proposed project is located); (ii) have installed capacity between 9MW to 27MW, and (iii) have started commercial operation before the start date of the proposed project, were selected for further common practise. In accordance with *Tool for the Demonstration and Assessment of Additionality (version 06.0.0)*, the projects under construction or seeking CDM assistance are not included in the analysis.

According to the MSW Construction Plan in Fujian Province[42], there were 9 MSW incineration projects recorded, in which 8 projects were put into operation in 2010 and 1 project-Jinjiang 2nd stage incineration project was put into operation in 2011[43]. As analysed in section B.5, the start date of the proposed project was 03/07/2010. Thus, there are 8 similar projects have started commercial operation before the start date of the proposed project. Among these 8 projects, Xiamen Houkeng (6MW)[44], Jinjiang 1st (7.5MW)[45] and

0.25 CNY/kwh for 15 years since operation but just the benchmark electricity tariff under provincial level where project located.

[39] Based on BOT contract signed between Fuqing City Management Bureau and the project developer and the real invoices of MSW disposal cost for the proposed project

[40] http://www.sznews.com/zhuanti/content/2006-04/20/content_99772.htm

[41] http://www.21cbh.com/HTML/2010-4-21/yNMDAwMDE3MzcyNQ.html

[42] http://www.fujian.gov.cn/wsbs/tzz/tzdt/200812/t20081215_103486.htm

[43] http://tieba.baidu.com/f?kz=256587356

[44] http://news.qq.com/a/20080111/001913.htm

[45] http://www.fjsen.com/misc/2007-12/04/content_366750.htm

Nan'an (7.5MW)[46] projects are not within the output range from 9 MW to 27 MW as indicated in step 1, therefore excluded from this common practise analysis. The details of other 5 projects are listed in Table B.5-6.

TableB.5-6 Projects similar to the Project in the common practice analysis region

Project name	Total investment (million RMB)	Waste disposal capacity (t/d)	Installed capacity (MW)	Technology	Operation Year
The proposed project					
Fuqing MSW Incineration Project	441	900	18	Grate type incinerator	--
The similar project					
1. Fujian Hongmiaoling MSW Incineration Project http://www.66163.com/Fujian_w/news/fzd/fzrb/20041227/GB/fzrb^2280^a0^rba01004.htm	400	1000	16	International Martin technology	2007
2. Fujian Shishi MSW Incineration Project http://huanbao.shishi.gov.cn/News/ShowArticle.asp?id=256	250	1400	24	Cogeneration	2008
3. Xiamen Eastern Incineration Project (applying CDM) http://cdm.unfccc.int/Projects/Validation/DB/397OZYUM18TUWVP61CTRZEH1JWHCR1/view.html	306	600	12	Grate type incinerator	2010
4. Hui'an Incineration Project (applying CDM) http://cdm.unfccc.int/Projects/Validation/DB/I0GAJ1ZDHCU6G3LXXOPF93WBZXBSPA/view.html	515	1200	24	Grate type incinerator	2010
5. Putian waste incineration projecthttp://www.ptxw.com/news/ptyw/201109/9/141854_0.shtml	270	1050	24	Grate type incinerator	2010

As listed above, **the Project 3 and the Project 4** are both applying CDM, thus excluded from this common practise analysis.

Therefore, it can be concluded from above analysis that there are 3 similar projects in Fujian province that operated without CDM support and started commercial operation before the start date of the proposed project, thus, the N_{all} is 3.

[46] http://www.nanandpc.com/ViewInfo.asp?id=213

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

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

As per the Paragraph 9 of the Tool for the demonstration and assessment of additionality (Version 06.0.0), different technologies in the context of common practise are technologies that deliver the same output and differ by at least one of the following (as appropriate in the context of the measure applied in the proposed CDM project and applicable geographical area):

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

The Project 1-Fujian Hongmiaoling MSW Incineration Project is the biggest project in Fujian province and developed by Chongqing Iron & Steel (Group) Co., Ltd[47] which is a large steel joint enterprise with hundred year's history and is the biggest state-owned company in Chongqing city. The total assets of the Chongqing Iron & Steel (Group) Co., Ltd are amount to 52.4 billion. Thus, the project has obviously no financial barrier. Furthermore, the project adopts international Martin technology which is also different from the proposed project.

The Project 2-Fujian Shishi MSW Incineration Project is developed by a private company. The project is a cogeneration plant; the energy of the project is used for both electricity and heat generation. Thus, the project is different from the proposed project.

The Project 5-Putian waste incineration project is constructed in 3 stages, the first and the second stages are developed by Putian Shengyuan Environmental Power Co., Ltd, which is a private company, and the third stage is developed by Huarun Group, which is State-owned Key Enterprise. In China, State-owned Key Enterprise has great financial advantages and policy advantages, so the investment environment of Putian waste incineration project is different from the proposed project. Moreover, the Putian waste incineration project is the first incineration project in Putian city and it is the Key Construction Project in Fujian province and the Key Municipal Facilities in Putian city, so it can get support from local government. Furthermore, the total capacity of this project is 24MW and total investment is 270 million,

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[47] http://www.cqgtjt.com/abouts/&FrontComContent_list01-001ContId=81794768-59aa-4616-adc6-cf1670b57aa7&comContentId=81794768-59aa-4616-adc6-cf1670b57aa7.html

so the project unit kilowatt investment is 11,250 RMB which is lower than the project unit kilowatt investment 24,500RMB.

In sum, based on the paragraph 9 of “Tool for the Demonstration and Assessment of Additionality” (version 06.0.0), different technologies between 3 similar projects and the proposed project are summarised as follows:

Item	The Project1	The Project 2	The Project 5
	Hongmiaoling	Shishi	Putian
(a)Energy source/fuel		◆	
(d)Investment climate of in the date of the investment decision			
(i)Access to technology	◆		◆
(ii)Subsidies or other financial flows	◆		◆
(iii)Promotional policies			
(iv)Legal regulations			
(e)other features, inter alia:			
(i) Unit cost of output (unit costs are considered different if they differ by at least 20 %)		◆	◆

As analysed above, 3 similar projects have obvious technical and financial advantage than the proposed project, so the N_{diff} is 3.

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

$F=1-N_{diff}/N_{all}=1-3/3=0$

According to the “Tool for Demonstration and Assessment of Additionality” (version 06.0.0), the proposed project is a common practice within a sector in the applicable geographical area if the factor F is greater than 0.2 and $N_{all}-N_{diff}$ is greater than 3. As analysis above, the factor F and $N_{all}-N_{diff}$ are both 0, therefore, it can be concluded that the Project is not a common practice.

Summary:
From the investment analysis it is clear that the specific project faces significant financial barriers. The common practice analyses confirm this argument.

Moreover, taking into account the financial difficulty faced by the project owner in the construction of the Project and the project's poor rate of return, the project owner decided to proceed with the implementation of the Project only if it could be registered as a CDM project. Thus, the proceeds of CERs are a key element for the Project. Given the above-mentioned prevalent practices for MSW treatment in China, and the barriers the project faces, it is clear that the Project fulfils the requirements of additionality.

Therefore, the Project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The methodology AM0025 (Version 12) is applied in the context of the Project in the following four steps:

- Firstly, calculate the project emissions;
- Secondly, calculate the baseline emissions;
- Thirdly, calculate the project leakage;
- Fourthly, calculated the emission reductions.

1. Project emissions

The project emissions in year y are:

$$PE_y = PE_{elec,y} + PE_{fuel,\ on\text{-}site,y} + PE_{c,y} + PE_{a,y} + PE_{g,y} + PE_{r,y} + PE_{i,y} + PE_{w,y} + PE_{co\text{-}firing,y} \quad (1)$$

Where:

PE_y	=	Is the project emissions during the year *y* (tCO_2e)
$PE_{elec,y}$	=	Is the emissions from electricity consumption on-site due to the project activity in year *y* (tCO_2e)
$PE_{fuel,\ on\text{-}site,y}$	=	Is the emissions on-site due to fuel consumption on-site in year *y* (tCO_2e)
$PE_{c,y}$	=	Is the emissions during the composting process in year *y* (tCO_2e)
$PE_{a,y}$	=	Is the emissions from the anaerobic digestion process in year *y* (tCO_2e)
$PE_{g,y}$	=	Is the emissions from the gasification process in year *y* (tCO_2e)
$PE_{r,y}$	=	Is the emissions from the combustion of RDF/stabilized biomass in year *y* (tCO_2e)
$PE_{i,y}$	=	Is the emissions from waste incineration in year *y* (tCO_2e)
$PE_{w,y}$	=	Is the emissions from wastewater treatment in year *y* (tCO_2e)
$PE_{co\text{-}firing,y}$	=	Is the emissions from thermal energy generation/electricity generation from on-site fossil fuel consumption during co-firing in year *y* (tCO_2e)

There are no emissions from composting process, anaerobic digestion process, gasification process combustion of RDF/stabilized biomass, or thermal energy generation/electricity generation since the Project activity only involves the incineration of waste. Therefore,

$$PE_y = PE_{elec,y} + PE_{fuel,on-site,y} + PE_{i,y} + PE_{w,y} \quad (2)$$

1.1 Emissions from electricity use on site ($PE_{elec, y}$)

$$PE_{elec,y} = EG_{PJ,FF,y} * CEF_{elec} \quad (3)$$

Where:

$EG_{PJ,FF,y}$	=	Is the amount of electricity consumed from the grid as a result of the project activity, measured using an electricity meter (MWh)
CEF_{elec}	=	Is the carbon emissions factor for electricity generation in the project activity (tCO_2/MWh). It is also referred to as CEF_d in equation 18.

The Project will generate electricity for on-site use and exported to the East China Power Grid. During the start-up, overhaul and shutdown of the incinerators the Project may import electricity from the ECPG. However, during the project design period, $EG_{PJ,FF,y}$=0. As a result, the value $PE_{elec,y}$ is zero in ex-ante calculation. $EG_{PJ,FF,y}$ will be monitored ex-post.

1.2 Emissions from fuel use on-site ($PE_{fuel, on\text{-}site,y}$)

According to FSR, the total consumption of diesel oil is 385t/a. Emissions from consumption of diesel oil are calculated as follows:

$$PE_{fuel,on-site,y} = F_{cons,y} * NCV_{fuel} * EF_{fuel} \quad (4)$$

Where:

$PE_{fuel, on\text{-}site,y}$	=	Is the CO_2 emissions due to diesel oil combustion in year *y* (tCO_2)
$F_{cons,y}$	=	Is the diesel oil consumption on site in year *y* (l or kg)
NCV_{fuel}	=	Is the net caloric value of the diesel oil (MJ/l or MJ/kg)
EF_{fuel}	=	Is the CO_2 emissions factor of the diesel oil (tCO_2/MJ)

Local values should be preferred as default values for the net calorific values and CO_2 emission factors. If local values are not available, IPCC default values may be used.

1.3 Emissions from waste incineration ($PE_{i, y}$)

Emissions from waste incineration are calculated as follows:

$$PE_{i,y} = PE_{i,f,y} + PE_{i,s,y} \quad (5)$$

Where:

$PE_{i,f,y}$	=	Is the fossil-based waste CO_2 emissions from waste incineration in year *y* (tCO_2e)
$PE_{i,s,y}$	=	Is the N_2O and CH_4 emissions from the final stacks from waste incineration in year *y* (tCO_2e)

1.3.1 Emissions from fossil-based waste ($PE_{i, f, y}$)

According to methodology, option 1 is selected.

$$PE_{i,f,y} = \sum_i A_i \times CCW_i \times FCF_i \times EF \times \frac{44}{12} \qquad (6)$$

Where:

$PE_{i,f,y}$	=	Is the fossil-based waste CO_2 emissions from waste incineration in year *y* (tCO_2e)
A_i	=	Is the amount of waste type i fed into the waste incineration plant (t/yr)
CCW_i	=	Is the fraction of carbon content in waste type i (fraction)
FCF_i	=	Is the fraction of fossil carbon in total carbon of waste type *i* (fraction)
EF	=	Is the combustion efficiency for waste (fraction)
44/12	=	Is the conversion factor (tCO_2/tC)

The amount of waste type i fed into the waste incineration plant (A_i) will be continuously monitored or calculated as per the following equation:

$$A_i = A_{MSW,y} \frac{\sum_{n=1}^{z} p_{n,i,y}}{z} \qquad (7)$$

Where:

A_i	=	Is the amount of waste type *i* fed into the waste incineration plant (t/yr)
$A_{MSW,y}$	=	Is the amount of MSW fed into the waste incineration plant (t/yr)
$p_{n,j,y}$	=	Is the weight fraction of the waste type *i* in the sample n collected during the year *y*
z	=	Number of samples collected during the year *y*

1.3.2 N_2O and CH_4 Emissions from waste incineration ($PE_{i, s, y}$)

According to methodology, option 2 is selected.

$$PE_{i,s,y} = Q_{biomass,y} \cdot \left(EF_{N2O} \cdot GWP_{N2O} + EF_{CH4} \cdot GWP_{CH4}\right) \cdot 10^{-3} \cdot CF \qquad (8)$$

Where:

$Q_{biomass,y}$	=	Is the amount of waste incinerated in year *y* (tonnes/yr)
EF_{N2O}	=	Is the aggregate N_2O emission factor for waste combustion (kgN_2O/tonne of waste). Table 5.4, chapter 5, volume 5 of IPCC 2006 guidelines is used for default value
EF_{CH4}	=	Is the aggregate CH_4 emission factor for waste combustion (kgCH_4/tonne of waste). Table 5.3, chapter 5, volume 5 of IPCC 2006 guidelines is used for default value
CF	=	Is the conservativeness factor. 1.37 is selected from Table 3 of AM0025 which is the most conservative

1.4 Emissions from wastewater treatment ($PE_{w,y}$)

The leachate will be pre-treated by anaerobic treatment and then discharged into the sewage treatment plant. The sewage and other washing waste water will be discharge directly into the waste water treatment plant through the municipal sewage network. So the emissions from the anaerobic treatment process are to be accounted for.
`
According to the AM0025, CH_4 emissions are estimated as follows:

$$PE_{CH_4,w,y} = Q_{COD,y} \cdot P_{COD,y} \cdot B_O \cdot MCF_p \qquad (9)$$

Where:

$PE_{CH4,w,y}$	=	Methane emissions from the wastewater treatment in year *y* (tCH_4/y)
$Q_{COD,y}$	=	Amount of wastewaster treated anaerobically from the project activity in year *y* (m^3/yr), which shall be measured monthly and aggregately annually
$P_{COD,y}$	=	Chemical Oxygen Demand (COD) of wastewaster (tCOD/m^3), which will be measured monthly and averaged annually
B_o	=	Maximum methane producing capacity (tCH_4/tCOD). IPCC 2006 guidelines specify the value for B_o as 0.25 kg CH_4/kgCOD. Taking into account the uncertainty of this estimate, a value of 0.265 kg CH_4/kgCOD is used as a conservative assumption for B_o
MCF_p	=	Methane conversion factor (fraction), preferably local specific value should be used. In absence of local values, MCF_p default value can be obtained from table 6.3, chapter 6, volume 5 from IPCC 2006 guidelines

In case of all the CH4 are emitted into the air directly, then:

$$PE_{w,y}=PE_{CH4,w,y} \cdot GWP_{CH4} \qquad (10)$$

2. Baseline emissions

Baseline emissions are calculated as follows:

$$BE_y = (MB_y - MD_{reg,y}) + BE_{EN,y} \qquad (11)$$

Where:

BE_y	=	Is the baseline emissions in year *y* (tCO_2e)
MB_y	=	Is the methane produced in the landfill in the absence of the project activity in year *y* (t_4CO_2e)
$MD_{reg,y}$	=	Is methane that would be destroyed in the absence of the project activity in year y (t_4CO_2e)
$BE_{EN,y}$	=	Baseline emissions from generation of energy displaced by the project activity in year y (tCO_2e)

Adjustment Factor (AF)

$$MD_{reg,y} = MB_y * AF \qquad (12)$$

Where:

AF	=	Is Adjustment Factor for MB_y (%)

The parameter AF shall be estimated as follows:

- In cases where a specific system for collection and destruction of methane is mandated by regulatory or contractual requirements, the ratio between the destruction efficiency of that system and the destruction efficiency of the system used in the project activity shall be used;
- In cases where a specific percentage of the "generated" amount of methane to be collected and destroyed is specified in the contract or mandated by the regulation, this percentage divided by an assumed efficiency for the collection and destruction system used in the project activity shall be used.

The proposed project is none of the cases mentioned above, as the Fuqing Yibadi Landfill Site does not currently capture and destroy any of the methane emissions that are derived there from. Therefore, $MD_{reg,y}$ is zero, so is the adjustment factor AF=0 according to $MD_{reg,y} = MB_y * AF$.

Rate of compliance ($RATE^{Compliance}{}_y$)

In case where there are regulations that mandate the use of one of the project activity treatment options and which is not being enforced, the baseline scenario is identified as a gradual improvement of waste management practices to the acceptable technical options expected over a period of time to comply with the MSW Management Rules. The adjusted baseline emissions ($BE_{y,a}$) are calculated as follows:

$$BE_{y,a} = BE_y * \left(1 - RATE^{Compliance}{}_y\right) \qquad (13)$$

Where:

BE_y	=	Is the CO_2-equivalent emissions
$RATE^{Compliance}{}_y$	=	Is the state-level compliance rate of the MSW Management Rules in that year y. The compliance rate shall be lower than 50%; if it exceeds 50% the project

activity shall receive no further credit.

In such cases $BE_{y,a}$ will replace BE_y to estimate emission reductions.

As for proposed project, no laws or regulations mandate the use of incineration option to treat municipal solid waste, and landfill is still the prevailing waste treatment in China presently. Therefore, Rate of Compliance for the Project is zero.

According to AM0025, The compliance ratio $RATE^{Compliance}_y$ shall be monitored *ex post* based on the official reports for instance annual reports provided by municipal bodies.

2.1 Methane generation from the landfill in the absence of the project activity (MB_y)

The amount of methane that is generated each year (MB_y) is calculated as per the latest version of the approved "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" considering the following additional equation:

$$MB_y = BE_{CH4,SWDS,y} = \varphi \cdot (1-f) \cdot GWP_{CH4} \cdot (1-OX) \cdot \frac{16}{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-k_j \cdot (y-x)} \cdot \left(1-e^{-k_j}\right) \quad (14)$$

Where:

$BE_{CH4,SWDS,y}$	=	Methane emissions avoided during the year y from preventing waste disposal at the solid waste disposal site (SWDS) during the period from the start of the project to the end of the year y (tCO_2e)
φ	=	Model correction factor to account for model uncertainties (0.9)
f	=	Fraction of methane captured at the SWDS and flared, combusted or used in another manner.(As mentioned above, 0 is applied)
GWP_{CH4}	=	Global Warming Potential (GWP) of methane, valid for the relevant commitment period
OX	=	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste). Table 3.2, chapter 3, volume 5 of IPCC 2006 guidelines is used for default value
F	=	Fraction of methane in the SWDS gas (volume fraction). Table 3.15, chapter 3, volume 5 of IPCC 2006 guidelines is used for default value
DOC_f	=	Fraction of degradable organic carbon (DOC) that can decompose. Table 3.13, chapter 3, volume 5 of IPCC 2006 guidelines is used for default value
MCF	=	Methane correction factor. Table 3.1, chapter 3, volume 5 of IPCC 2006 guidelines is used for default value
$W_{j,x}$	=	Amount of organic waste type j prevented from disposal in the SWDS in the year x (tons)
DOC_j	=	Fraction of degradable organic carbon (by weight) in the waste type j. Table 2.4, chapter 2, volume 5 of IPCC 2006 guidelines is used for default value
k_j	=	Decay rate for the waste type j. Table 3.3, chapter 3, volume 5 of IPCC 2006 guidelines is used for default value
j	=	Waste type category (index)

x	=	Year during the crediting period: x runs from the first year of the first crediting period (x=1) to the year y for which avoided emissions are calculated (x=y)
y	=	Year for which methane emissions is calculated

Where different waste type j are prevented from disposal, determine the amount of different waste types ($W_{j,x}$) through sampling and calculate the mean from the samples, as follows:

$$W_{j,x} = W_x \cdot \frac{\sum_{n=1}^{z} p_{n,j,x}}{z} \qquad (15)$$

Where:

$W_{j,x}$	=	Amount of organic waste type j prevented from disposal in the SWDS in the year x (tons)
W_x	=	Total amount of organic waste prevented from disposal in year x (tons)
$P_{n,j,x}$	=	Weight fraction of the waste type j in the sample n collected during the year x
z	=	Number of samples collected during the year x

2.2 Baseline emissions from generation of energy ($BE_{EN,y}$)

The Project activity is not involved heat recovered for thermal demand but the electricity generation. Therefore, the $BE_{EN,y}$ is calculated as follows:

$$BE_{EN,y} = BE_{elec,y} = EG_{d,y} * CEF_d \qquad (16)$$

Where:

$BE_{elec,y}$	=	Is the baseline emissions from electricity generated utilizing combustion heat from incineration in the project activity and exported to the grid (tCO_2e)
$EG_{d,y}$	=	Is the amount of electricity generated utilizing the combustion heat from incineration in the project activity and exported to the grid during the year y (MWh)
CEF_d	=	Is the carbon emissions factor for the displaced electricity source in the project scenario (tCO_2/MWh)

Determination of CEF_d

In case the generated electricity from the combustion heat from incineration displaces electricity that would have been generated by other power plants in the grid in the baseline, CEF_d should be calculated according to the "Tool to calculate the emission factor for an electricity system" as follows:

STEP 1. Identify the relevant electric power system

The Chinese DNA - Office of Climate Change under the National Development and Reform Commission has published a delineation of the project electricity system and connected electricity system. According to the delineation, the electricity generated by the Project activity is connected to the East China Power

Grid, which is composed of Shanghai Power Grid, Jiangsu Power Grid, Zhejiang Power Grid, Anhui Power Grid and Fujian Power Grid.

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

No off-grid power plant included in the Project, so the Project choose Option Ⅰ−only grid power plants are included in the calculation, to calculate the operating margin and build margin emission factor.

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

The Operating Margin Emission Factor ($EF_{OM,y}$) is based on one of the following methods:

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

The simple OM method (option a) can only be used if low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

Among the total electricity generation of East China Power Grid which the Project is connected to, the amount of low-cost/must-run resources accounts for about 11% in 2003, 11% in 2004, 12% in 2005, 11% in 2006 and 11% in 2007, all less than 50%. Thus, the method (a) simple OM can be used to calculate the baseline emission factor of operating margin for the Project.

In calculating the simple OM, the ex-ante option of a 3-year generation-weighted average is chosen, and is based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, thus removing the requirement to monitor and recalculate the emissions factor during the crediting period.

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

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generation power plants serving the system, not including low-cost/must-run power plants/units. It may be calculated:

Option A Based on the net electricity generation and a CO_2 emission factor of each power unit; or

Option B Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

The Project selects Option B due to the following reasons:

a) The data on the net electricity generation and CO_2 emission factor for each power unit is not publicly available in China; and

b) The power resources of the low-cost/must-run power plants/units serving the ECPG are only nuclear and renewable resources, and the quantity of electricity supplied to the grid by these resources are publicly available; and
c) Off-grid power plants are not included in the calculation.

Under Option B, the simple OM emission factor is calculated as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i (FC_{i,y} \times NCV_{i,y} \times EF_{co_2,i,y})}{EG_y} \qquad (17)$$

Where:

$EF_{grid,\ OMsimple,\ y}$	=	Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$FC_{i,\ y}$	=	Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit).
$NCV_{i,\ y}$	=	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit) (country-specific values are used)
$EF_{CO2,\ i,\ y}$	=	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
EG_y	=	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)
i	=	All fossil fuel types combusted in power sources in the project electricity system in year y
y	=	The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation

According to the above steps and the emission factor of ECPG published by Chinese DNA on its website, a 3-year average Simple OM Emission Factor of ECPG is:

$EF_{grid,OM,y}$=0.8592 tCO_2e/MWh

The detailed calculation is shown in Annex 3.

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

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, which requires the project participant to calculate the build margin emission factor $EF_{grid,BM,y}$ *ex-ante* based on the most recent information available already built for sample group m at the time of PDD submission.

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

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

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

(c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});
Identify the date when the power units in SET_{sample} started to supply electricity to the grid.
If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. In this case ignore steps (d), (e) and (f).
Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than10 years ago. Include in that set the power units registered as CDM project activities, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);
If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET\text{-}sample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore steps (e) and (f).
Otherwise:

(e) Include in the sample group $SET_{sample\text{-}CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power units m used to calculate the build margin is the resulting set ($SET_{sample\text{-}}$

CDM->10yrs).

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

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

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{BL,m,y}}{\sum_m EG_{m,y}} \qquad (18)$$

Where:

$EF_{grid,,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{BL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)

m = Power units included in the build margin

y = Most recent historical year for which power generation data is available

Because capacities of technologies using coal, oil and gas cannot be separated from the total thermal power generation from publicly available statistics, the following method is used for the calculation: first, use the energy balance data of the most recent year available and calculate the percentages of CO_2 emissions of power generation using solid, liquid and gas fuel in the total CO_2 emission. Second, calculate grid thermal power emission factors, using the percentages (as weights) and emission factors of technologies corresponding to best available efficiencies. Lastly, the thermal power emission factor is multiplied by the percentage of thermal power in the newest 20% capacity in the grid, and the result is the Build Margin emission factor of the grid.

Note that the data used can not distinguish the capacity installed in coal, fossil fuel, and gas from total fire power generation. Therefore, the calculation used as following:

Step a, percentage of CO_2 emitted, λ, for each solid, liquid and gas power generation:

$$\lambda_{coal,y} = \frac{\sum_{i=coal,j} F_{i,j,y} * NCV_{i,y} * EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} * NCV_{i,y} * EF_{CO_2,i,j,y}} \qquad (19)$$

$$\lambda_{Oil,y} = \frac{\sum_{i=oil,j} F_{i,j,y} * NCV_{i,y} * EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} * NCV_{i,y} * EF_{CO_2,i,j,y}} \qquad (20)$$

$$\lambda_{Gas,y} = \frac{\sum_{i=Gas,j} F_{i,j,y} * NCV_{i,y} * EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} * NCV_{i,y} * EF_{CO_2,i,j,y}} \qquad (21)$$

Where:

$F_{i,j,y}$ = the fuel, i (tce), consumption of province, j, in year, y

$NCV_{i,y}$ = Net calorific value of the biomass residue type i (GJ/ton of dry matter or GJ/liter)

$EF_{CO2,i,j,y}$ = Emission factor of type i, j in year y (tCO_2/MWh)

Coal, Oil and Gas = Solid fuel, liquid fuel and gaseous fuel respectively

Step b: calculating $EF_{Thermal,y}$

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \qquad (22)$$

Where: $EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas,Adv,y}$ are emission factors of the most advanced commercial coal, oil and gas power generation technologies.

Step c: calculating $EF_{grid,BM,y}$:

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \qquad (23)$$

Where,

$CAP_{Total,y}$ = total newly capacity installed;

$CAP_{Thermal,y}$ = capacity of thermal generation installed.

According to the above steps and the emission factor of ECPG published by Chinese DNA on its website, the BM Emission Factor of ECPG is:

$EF_{grid,BM,y}$= 0.6789 tCO_2e/MWh

The detailed calculation is shown in Annex 3.

STEP 6. Calculate the combined margin emissions factor

The combined margin emission factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OMsimple,y} \times w_{OM,y} + EF_{grid,BM,y} \times w_{BM,y} \quad (24)$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)

w_{OM} = weighting of operating margin emissions factor (%)

W_{BM} = Weighting of build margin emissions factor (%)

The following default values will be applied for w_{OM} and w_{BM}:

w_{OM} = 0.5 and w_{BM} = 0.5 for the crediting period.

The baseline emission factor is:

$CEF_d = EF_{grid,CM,y} = 0.8592 \times 0.5 + 0.6789 \times 0.5 = 0.7691$ tCO_2e/MWh

3. Leakage

The proposed project is involved MSW incineration. So the leakage emissions will be estimated from the following equation:

$$L_y = L_{t,y} + L_{i,y} \quad (25)$$

Where:

$L_{t,y}$ = Is the leakage emissions from increased transport in year *y* (tCO_2e)

$L_{i,y}$ = Is the leakage emissions from the residual waste from MSW incinerator in year *y* (tCO_2e)

3.1 Emissions from transportation ($L_{t,y}$)

According to the methodology, leakage would occur when the waste is transported from waste collecting points, in the collection area, to the treatment facility, instead of to existing landfills. When it is likely that the transport emissions will increase significantly, such emissions should be incorporated as leakage. As for the proposed project, it is located near the Fuqing Yibadi Landfill site. So the leakage emissions from increased transport can be negligible, and the $L_{t,y}$ is assumed to be 0.

3.2 Emissions from the residue waste in MSW incineration ($L_{i,y}$)

According to the methodology, in case of waste incineration, leakage emissions from residual waste of MSW incinerator should be accounted for using the following equations:

If the residual waste from the incinerator contains up to 5% residual carbon then:

$$L_{i,y} = A_{residual}.FC_{residual}\cdot\frac{44}{12} \qquad (26)$$

If the residual waste from the incinerator contains more than 5% residual carbon then:

$$L_{i,y} = A_{residualy}\cdot 0.05\cdot\frac{44}{12} + A_{residual,y}\cdot(FC_{residual} - 0.05)\cdot\frac{16}{12}\cdot 21 \qquad (27)$$

Where:

$L_{i,y}$	=	Is the leakage emissions from the residual waste of MSW incinerator in year *y* (tCO_2e)
$A_{residual,y}$	=	Is the amount of the residual waste from the incinerator (t/yr)
$FC_{residual}$	=	Is the fraction of residual carbon contained in the residual waste (%)
$\frac{44}{12}$	=	Is a factor to convert from Carbon to Carbon Dioxide
$\frac{16}{12}$	=	Is factor to convert from Carbon to methane
21	=	Is the Global Warming Potential of methane (tCO_2/tCH_4)

4. Emissions Reductions

Emissions reductions will be calculated as follows:

$$ER_y = BE_y - PE_y - L_y \qquad (28)$$

Where:

ER_y	=	Is the emissions reductions in year *y* (t CO_2e)
BE_y	=	Is the emissions in the baseline scenario in year *y* (tCO_2e)
PE_y	=	Is the emissions in the project scenario in year *y* (tCO_2e)
L_y	=	Is the leakage in year *y* (tCO_2e)

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

Data / Parameter:	**GWP_{CH4}**
Data unit:	tCO_2/tCH_4
Description:	Global warming potential of CH_4

Source of data used:	Decisions under UNFCCC and Kyoto Protocol
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	21 for the first commitment period. Shall be updated according to any future COP/MOP decisions.
Any comment:	-

Data / Parameter:	**GWP_{N2O}**
Data unit:	tCO_2e/tN_2O
Description:	Global warming potential of N_2O
Source of data used:	Decisions under UNFCCC and Kyoto Protocol
Value applied:	310
Justification of the choice of data or description of measurement methods and procedures actually applied :	310 for the first commitment period. Shall be updated according to any future COP/MOP decisions.
Any comment:	-

Data / Parameter:	**EF_{CH4}**
Data unit:	$kgCH_4$/tonne
Description:	Aggregate CH_4 emission factor for waste combustion
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 5, Table 5.3.
Value applied:	0.2×10^{-3}
Justification of the choice of data or description of measurement methods and procedures actually applied :	Using 2006 IPCC Guidelines for default value
Any comment:	-

Data / Parameter:	**EF_{N2O}**
Data unit:	kgN_2O/tonne
Description:	Aggregate N_2O emission factor for waste combustion
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 5, Table 5.4.
Value applied:	0.047
Justification of the choice of data or description of measurement methods	Using 2006 IPCC Guidelines for default value

and procedures actually applied :	
Any comment:	-

Data / Parameter:	φ
Data unit:	-
Description:	Model correction factor to account for model uncertainties
Source of data used:	Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value suggested in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
Any comment:	-

Data / Parameter:	**OX**
Data unit:	-
Description:	Oxidation factor
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 3, Table 3.2.
Value applied:	0.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC Suggest a baseline scenario if the landfill is covered by oxidizing substances such as soil cover, then Oxidation coefficient should be 0.1.
Any comment:	-

Data / Parameter:	**F**
Data unit:	-
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 3, Page 3.15.
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Most waste in SWDS generates a gas with approximately 50 percent CH_4. Only material including substantial amounts of fat or oil can generate gas with substantially more than 50 percent CH_4. The use of the IPCC default value for the fraction of CH_4 in landfill gas (0.5) is therefore encouraged.
Any comment:	-

Data / Parameter:	**DOC_f**

Data unit:	-
Description:	Fraction of degradable organic carbon (DOC) that can decompose
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 3, Page 3.13.
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Fraction of degradable organic carbon which decomposes (DOC_f) is an estimate of the fraction of carbon that is ultimately degraded and released from SWDS, and reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the SWDS. The recommended default value for DOC_f is 0.5 (under the assumption that the SWDS environment is anaerobic and the DOC values include lignin)
Any comment:	-

Data / Parameter:	**MCF**
Data unit:	-
Description:	Methane correction factor
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 3, Table 3.1.
Value applied:	0.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value 0.8 is for all SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 metres.
Any comment:	-

Data / Parameter:	**k_j**
Data unit:	-
Description:	Decay rate for waste type j
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 3, Table 3.3.
Value applied:	

Type of Waste		**Tropical** (MAT>20℃) **Moist and Wet** (MAP≥1000mm)
Slowly degrading waste	Paper/textiles waste	0.07
	Wood/straw waste	0.035
Moderately degrading waste	Other(non-food) organic putrescible/Garden and park waste	0.17
Rapidly degrading waste	Food waste/Sewage sludge	0.4

Justification of the choice of data or description of measurement methods and procedures actually applied :	According to Fuzhou Yearbook 2004-2010[48][49][50][51][52][53] (lack of data in Fuzhou Yearbook 2007), the Mean Annual Temperature (MAT) of Fuqing city is 20.6ºC and the Mean Annual Precipitation (MAP) is 1451.05mm. Based on this data, the climate is classed as: Tropical, Moist and Wet.
Any comment:	-

Data / Parameter:	**DOC_j**
Data unit:	-
Description:	Fraction of degradable organic carbon (by weight) in waste type j
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 2, Table 2.4.
Value applied:	see table below
Justification of the choice of data or description of measurement methods and procedures actually applied :	Using 2006 IPCC Guidelines for default value
Any comment:	-

MSW component	**DOC content in % of wet waste**
Paper/cardboard	40
Textiles	24
Food waste	15
Wood	43
Garden and Park waste	20
Rubber	-
Plastics	-
Metal	-
Glass	-
Other, inert waste	-

Data / Parameter:	**EF_{fuel}**
Data unit:	tCO_2e/MJ
Description:	Emission factor of the diesel oil consumed by the project activity
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2,

[48] http://www.fzdqw.com/ShowText.asp?ToBook=1307&index=18&

[49] http://www.fzdqw.com/ShowText.asp?ToBook=1308&index=20&

[50] http://www.fzdqw.com/ShowText.asp?ToBook=1309&index=16&

[51] http://www.fzdqw.com/showtext.asp?ToBook=1313&index=19&

[52] http://www.fzdqw.com/ShowText.asp?ToBook=1314&index=17&

[53] http://www.fzdqw.com/ShowText.asp?ToBook=1323&index=14&

	Chapter 1, Table 1.4.
Value applied:	74.1×10^{-6}
Justification of the choice of data or description of measurement methods and procedures actually applied :	Using 2006 IPCC Guidelines for default value
Any comment:	-

Data / Parameter:	**$NCV_{fossil\ fuel}$**
Data unit:	MJ/kg
Description:	Net calorific value of diesel oil consumed by the project activity
Source of data used:	“Chinese Energy Statistical Yearbook” 2008
Value applied:	42.652
Justification of the choice of data or description of measurement methods and procedures actually applied :	China Energy Statistical Yearbook is an authoritative publication.
Any comment:	The source of data should be the following, in order of preference: project specific data, country specific data or IPCC default value. As per guidance from the UNFCCC Executive Board, IPCC default values should be used only when country or project specific data are not available or difficult to obtain.

Data / Parameter:	**Bo**
Data unit:	tCH_4/tCOD
Description:	Maximum methane producing capacity
Source of data used:	Methodology AM0025
Value applied:	0.265
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC 2006 guidelines specifies the value for B_o as 0.25 kg CH_4/kg COD. Taking into account the uncertainty of this estimate, project participant should use a value of 0.265 kg CH_4/kg COD as a conservative assumption for B_o.
Any comment:	-

Data / Parameter:	**MCF_p**
Data unit:	-
Description:	Methane conversion factor (fraction)
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 6, Table 6.3.
Value applied:	0.8
Justification of the choice of data or	Project specific data or country specific data is not available; therefore IPCC default value is used as per guidance from the Board.

description of measurement methods and procedures actually applied :	The anaerobic reactor is used to treat the leachate generated in the Project. So the default value 0.8 is preferred.
Any comment:	-

Data / Parameter:	**$FC_{i,y}$**
Data unit:	Mass or volume unit
Description:	Amount of fossil fuel type i consumed by the ECPG in year y
Source of data used:	China Energy Statistical Yearbook 2007~2009
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	China Energy Statistical Yearbook is an authoritative publication.
Any comment:	-

Data / Parameter:	**$NCV_{i,y}$**
Data unit:	GJ/mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel type i consumed by power sources / plants connected to the ECPG in year y
Source of data used:	China Energy Statistical Yearbook 2008
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	China Energy Statistical Yearbook is an authoritative publication.
Any comment:	-

Data / Parameter:	**$EF_{CO2,i,y}$**
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor per unit of energy of fuel i
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, volume 2, table 1.4 of Chapter 1
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Using 2006 IPCC Guidelines for default value at the lower limit of the uncertainty at a 95% confidence interval.
Any comment:	-

Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Net electricity generated and delivered to the ECPG by power plant/unit j in year y, except for the low-cost/must-run power plant
Source of data used:	China Electric Power Yearbook 2007~2009
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	China Electric Power Yearbook is an authoritative publication.
Any comment:	-

Data / Parameter:	**Rate of Electricity Consumption**
Data unit:	%
Description:	Average on-site electricity usage by all power plants connected to the provincial grids covered by the ECPG
Source of data used:	China Electric Power Yearbook 2007~2009
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	China Electric Power Yearbook is an authoritative publication.
Any comment:	-

Data / Parameter:	**AF**
Data unit:	%
Description:	Methane destroyed due to regulatory or other requirements
Source of data used:	Local and/or national authorithies
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	The Fuqing Yibadi Landfill Site does not currently capture and destroy any of the methane emissions that are derived from the MSW disposed of there.
Any comment:	Relevant regulations shall be updated at the beginning of each crediting period. As the project uses fixed 10-year crediting period, so the data applied above is fixed during the first crediting period.

Data / Parameter:	**CF**
Data unit:	-
Description:	Conservativeness factor
Source of data used:	Methodology AM0025

Value applied:	1.37
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the methodology, if IPCC default emission factor is used, a conservativeness factor should be applied to account for the high uncertainty of the IPCC default values. The level of the conservativeness factor depends on the uncertainty range of the estimate for the IPCC default N_2O and CH_4 emission factor. For the proposed project activity, the highest value 1.37 from Table 3 is selected which is most conservative for the project.
Any comment:	-

Data / Parameter:	**f**
Data unit:	-
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
Source of data used:	Site visit at the solid waste disposal site
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

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

1. Baseline emissions

Baseline emissions are claimed for the following sources:

- Emissions from decomposition of waste at the landfill site
- Emissions from displaced grid electricity

$BE_y = BE_{CH4.SWDS,\,y} + BE_{elec,\,y}$

1.1 Emissions from decomposition of waste at the landfill site

The table below shows the values used for the CH_4 emission calculation. These values were chosen in a conservative manner using IPCC defaults and the amount of waste.

$$BE_{CH_4,SWDS,y} = \phi\left(1-f\right)\cdot GWP_{CH_4}\cdot\left(1-OX\right)\cdot\frac{16}{12}\cdot F\cdot DOC_f\cdot MCF\cdot\sum_{x=1}^{y}\sum_{j}W_{j,x}\cdot DOC_j\cdot e^{-k_j\cdot(y-x)}\cdot\left(1-e^{-k_j}\right)$$

	Description	Value	Data Source
φ	Model correction factor to account for model uncertainties	0.9	AM0025

f	Fraction of methane captured at the SWDS and flared, combusted or used in another manner	0			AM0025
GWP_{CH4}	Global Warming Potential of methane	21			UNFCCC and Kyoto Protocol
OX	Oxidation factor	0.1			IPCC2006
F	Fraction of methane in the SWDS gas	0.5			IPCC2006
DOC_f	Fraction of degradable organic carbon that can decompose	0.5			IPCC2006
MCF	Methane correction factor	0.8			IPCC2006
$W_{j,x}$	Amount of organic waste type j prevented from disposal in the SWDS in the year x	Paper and cardboard	12.47%	37,410	Feasibility Study Report
		Textile	2.87%	8,610	
		Food waste	59.95%	179,850	
		Wood	0.81%	2,430	
		Garden and Park waste	0	0	
		Rubber	0.6%	1,800	
		Plastic	5.4%	16,200	
		Metal	0.16%	480	
		Glass and pottery	1.91%	5,730	
		Other, inert waste	15.83%	47,490	
		Total	100%	300,000	
DOC j	DOC content in % of wet waste	Paper and cardboard		40%	IPCC 2006
		Textile		24%	
		Food waste		15%	
		Wood		43%	
		Garden and Park waste		20%	
		Rubber		-	
		Plastic		-	
		Metal		-	
		Glass and pottery		-	
		Other, inert waste		-	
K_j	Decay rate for the waste type j	Paper and cardboard		0.07	IPCC 2006 Mean Annual Temperature (MAT) = 20.63ºC Mean Annual Precipitation (MAP) = 1451.05mm Potential
		Textile		0.07	
		Food waste		0.4	
		Wood		0.035	
		Garden and Park waste		0.17	
		Rubber		-	
		Plastic		-	

		Metal	-	
		Glass and pottery	-	
		Other, inert waste	-	
y	Year for which the methane emission calculated.	10		

Baseline emission reductions from the decay of MSW are presented below:

Year	Emission from the decay of MSW (tco_2/yr)
01/09/2012-31/08/2013	45,729
01/09/2013-31/08/2014	77,798
01/09/2014-31/08/2015	100,618
01/09/2015-31/08/2016	117,149
01/09/2016-31/08/2017	129,383
01/09/2017-31/08/2018	138,660
01/09/2018-31/08/2019	145,883
01/09/2019-31/08/2020	151,663
01/09/2020-31/08/2021	156,414
01/09/2021-31/08/2022	160,417

1.2 Emissions from displaced grid electricity

As explained in B.6.1., the OM and BM have been calculated ex ante CEF using data that has been publicly released by the Chinese DNA (see Annex 3 for tables). The OM is 0.8592 tCO_2/MWh and the BM is 0.6789 tCO_2/MWh, giving a CM (CEF) of 0.7691 tCO_2/MWh. The emissions associated with this amount of grid-generated electricity are calculated as follows:

$BE_{elec,\,y} = EG_y\ .CEF_d$

$= 87{,}703 MWh * 0.7691\ tCO_2/MWh$

$= 67{,}452\ tCO_2e$

2. Project emissions

Project emissions are determined for the following sources:

- Emissions from electricity consumption on-site in the year y ($PE_{elec,\,y}$)
- Emissions from fuel use on-site in the year y ($PE_{fuel,\,onsite,\,y}$)
- Emissions from waste incineration in the year y ($PE_{i,y}$)

- Emissions from wastewater treatment in the year y ($PE_{w,y}$)

2.1 Emissions from electricity consumption on-site in the year y ($PE_{elec, y}$)

During the project design period, $EG_{PJ,FF,y}$=0. As a result, the value $PE_{elec,y}$ is zero in ex-ante calculation.

2.2 Emissions from fuel use on-site in the year y ($PE_{fuel, onsite, y}$)

According to the FSR, the project is expected to consume approximately 385 tonnes of diesel oil per year. The actual fuel consumption will be measured according to the Monitoring methodology for ex-post emission reduction. Emissions from this source are therefore calculated as follows:

Parameter	Description	Unit	Value	Data Source
$F_{cons,y}$	fuel consumption on site in year y	kg	385,000	Feasibility Study Report
NCV_{fuel}	net caloric value of the fuel	MJ/kg	42.652	China Energy Statistical Yearbook 2007
EF_{fuel}	CO_2 emissions factor of the fuel	tCO_2/MJ	74.1×10^{-6}	IPCC 2006

$$PE_{fuel, on\text{-}site, y} = F_{cons, y} * NCV_{fuel} * EF_{fuel}$$

$$=1,217\ tCO_2$$

2.3 Emissions from waste incineration in the year y ($PE_{i, y}$)

Emissions from waste incineration are calculated as follows:

$$PE_{i, y} = PE_{i, f, y} + PE_{i, s, y}$$

2.3.1 Emissions from fossil-based waste ($PE_{i, f, y}$)

$$PE_{i,f,y} = \sum_i A_i \times CCW_i \times FCF_i \times EF \times \frac{44}{12}$$

The amounts of each waste type and their respective CCW_i, FCF_i and combustion efficiencies are shown in the table below:

$PE_{i, f, y}$ = 53,088 tCO_2

Waste type	Weight (ton)	Dry matter content in % of wet weight	CCWi (%)	FCFi (%)	EF	$PE_{i,f,y}$
Paper and cardboard	37,410	90	46	1	1	568
Textiles	8,610	80	50	20	1	2,526
Food waste	179,850	40	38	-	1	0

Wood	2,430	85	50	-	1	0
Garden and park waste	0	40	49	-	1	0
Rubber	1,800	84	67	20	1	743
Plastic	16,200	100	75	100	1	44,550
Metal	480	100	-	-	1	0
Glass and pottery	5,730	100	-	-	1	0
Other, inert waste	47,490	90	3	100	1	4,702
Total	300,000					53,088
Data source	Calculated	IPCC 2006	IPCC 2006	IPCC 2006	IPCC 2006	Calculated

2.3.2 Emissions of N_2O and CH_4 may be estimated from waste incineration ($PE_{i,s,y}$)

The Project will combust approximately 300,000 tonnes of MSW per year. Emissions from this source are therefore calculated in the table as follows:

Parameter	Description	Value	Date Source
$Q_{biomass,y}$	The amount of waste incinerated in year y (t/yr)	300,000	Feasibility Study Report
EF_{N20}	The aggregated N_2O emission factor for waste combustion (gN_2O/t)	47	IPCC 2006
GWP_{N20}	Global Warming Potential of N_2O	310	UNFCCC and Kyoto Protocol
EF_{CH4}	The aggregated CH_4 emission factor for waste combustion (gCH_4/t)	0.2	IPCC 2006
GWP_{CH4}	Global Warming Potential of methane	21	UNFCCC and Kyoto Protocol
CF	Conservativeness factor	1.37	AM0025

$$PE_{i,s,y} = Q_{biomass,y} * (EF_{N2O} * GWP_{N2O} + EF_{CH4} * GWP_{CH4}) * 10^{-6} * CF$$

$$= 5,990\ tCO_2$$

2.4 Emissions from wastewater treatment in the year y ($PE_{w,y}$)

According to the Project FSR, the Project will produce about $135m^3/d$ leachate. Emissions from this source are therefore calculated in the table as follows:

Parameter	Description	Value	Date Source
$Q_{COD,y}$	Amount of wastewater treated anaerobically or released untreated from the project activity in year y (m^3/y)	44,550	Feasibility Study Report
$P_{COD,y}$	Chemical Oxygen Demand (COD) of wastewater ($tCOD/m^3$)	0.06	Feasibility Study Report

B_o	Maximum methane producing capacity ($tCH_4/tCOD$)	0.265	AM0025
MCF_p	Methane conversion factor (fraction)	0.8	IPCC 2006
GWP_{CH4}	Global Warming Potential of methane	21	UNFCCC and Kyoto Protocol

$PE_{w,y} = Q_{COD,y} * P_{COD,y} * B_0 * MCF_p * GWP_{CH4}$

$= 11{,}900\ t/CO_2e$

Project emissions are estimated as follows:

$PE_y = PE_{elec,y} + PE_{fuel,on\text{-}site,y} + PE_{i,y} + PE_{w,y}$

$= 72{,}195\ tCO_2e$

3. Leakage

As described in section B.6.1, the leakage emission is calculated as follows:

$L_y = L_{t,y} + L_{i,y}$

3.1 Emissions from transportation ($L_{t,y}$)

The Project is just located close to the Fuqing Yibadi Landfill site. So the leakage emissions from increased transport can be negligible, and the $L_{t,y}$ is assumed to be 0.

3.2 The emission from the residual waste from MSW incinerator ($L_{i,y}$)

Parameter	Description	Value	Date Source
$A_{residual}$	Amount of residual waste from the Incinerator (t/yr)	44,550	Feasibility Study Report
$FC_{residual.}$	Fraction of residual carbon contained in the residual waste	3%	Feasibility Study Report

$L_{i,y} = A_{residual}.FC_{residual}.44/12$

$= 44{,}550 \times 3\% \times 44/12$

$= 4{,}901\ tCO_2$

So the calculation for the L_y is

$L_y = L_{i,y} = 4{,}901\ tCO_2$

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

Year	Estimation of	Estimation of	Estimation of	Estimation of

	project emissions (tCO_2e)	baseline emissions (tCO_2e)	leakage (tCO_2e)	emission reduction (tCO_2e)
01/09/2012-31/08/2013	72,195	113,181	4,901	36,086
01/09/2013-31/08/2014	72,195	145,250	4,901	68,155
01/09/2014-31/08/2015	72,195	168,070	4,901	90,975
01/09/2015-31/08/2016	72,195	184,601	4,901	107,506
01/09/2016-31/08/2017	72,195	196,835	4,901	119,740
01/09/2017-31/08/2018	72,195	206,112	4,901	129,017
01/09/2018-31/08/2019	72,195	213,335	4,901	136,240
01/09/2019-31/08/2020	72,195	219,116	4,901	142,020
01/09/2020-31/08/2021	72,195	223,867	4,901	146,771
01/09/2021-31/08/2022	72,195	227,869	4,901	150,774
Total (tCO_2e)	721,949	1,898,237	49,005	1,127,283

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{PJ,FF,y}$
Data unit:	MWh
Description:	Amount of electricity consumed from the grid as a result of the project activity.
Source of data to be used:	Electricity meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0 (ex-ante)
Description of measurement methods and procedures to be applied:	Monitored continuously. The readings of electricity meter will be aggregated monthly and annually.
QA/QC procedures to be applied:	Electricity meter will be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy. The readings will be double cheeked by the electricity distribution company.
Any comment:	-

Data / Parameter:	$F_{cons,y}$
Data unit:	Tonnes/year
Description:	Diesel oil consumption on-site during year of the crediting period
Source of data to be used:	Purchase invoice and/or metering

Value of data applied for the purpose of calculating expected emission reductions in section B.5	385
Description of measurement methods and procedures to be applied:	Monitored annually
QA/QC procedures to be applied:	The measured amount of fuel consumed can be cross-checked against the paid fuel invoices (administrative obligation)
Any comment:	-

Data / Parameter:	$\mathbf{A_{MSW,y}}$
Data unit:	tonnes/yr
Description:	Amount of MSW fed into the waste incineration plant
Source of data to be used:	Project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	300,000
Description of measurement methods and procedures to be applied:	Monitored when each waste truck entering the incineration plant. The data will be aggregated annually.
QA/QC procedures to be applied:	Weighbridges will be subject to periodic calibration in accordance with manufacturer's technical specifications and requirements.
Any comment:	This parameter is also referred as $Q_{bilmass,y}$ and $W_{j,x}$ in this document.

Data / Parameter:	$\mathbf{P_{n,i,,y}}$
Data unit:	-
Description:	Weight fraction of the waste type i in the sample n collected during the year y
Source of data to be used:	Sample measurements by project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	The size and frequency of sampling should be statistically significant with a maximum uncertainty range of 20% at a 95% confidence level. As a minimum, sampling should be undertaken four times per year.
QA/QC procedures to be applied:	-

Any comment:	-

Data / Parameter:	**z**
Data unit:	-
Description:	Number of samples collected during the year y
Source of data to be used:	Project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Continuously, aggregated annually
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	**CCW_i**
Data unit:	Fraction
Description:	Fraction of carbon content in waste type i
Source of data to be used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 2, Table 2.4.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	(see table below)
Description of measurement methods and procedures to be applied:	As per guidance from the Board, IPCC default values should be used only when country or project specific data are not available or difficult to obtain.
QA/QC procedures to be applied:	-
Any comment:	-

MSW component	Total carbon content in % of dry weight
Paper/cardboard	46
Textiles	50
Food waste	38
Wood	50
Garden and Park waste	49
Rubber	67
Plastics	75
Metal	NA
Glass	NA
Other, inert waste	3

Data / Parameter:	**FCF_i**

Data unit:	fraction
Description:	Fraction of fossil carbon in total carbon of waste type i
Source of data to be used:	Sample measurements by project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	MSW component / Fossil carbon fraction in % of total carbon: Paper/cardboard 1; Textiles 20; Food waste -; Wood -; Garden and Park waste 0; Rubber 20; Plastics 100; Metal NA; Glass NA; Other, inert waste 100
Description of measurement methods and procedures to be applied:	The size and frequency of sampling should be statistically significant with a maximum uncertainty range of 20% at a 95% confidence level. As a minimum, sampling should be undertaken four times per year. The following standards should be used to estimate fossil carbon fraction of waste type i: • ASTM D6866-08: “Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis"; • ASTM D7459-08: “Standard Practice for Collection of Integrated Samples for the Speciation of Biomass (Biogenic) and Fossil- Derived Carbon Dioxide Emitted from Stationary Emissions Sources"
QA/QC procedures to be applied:	From IPCC guidelines. QA/QC procedures not applicable.
Any comment:	-

MSW component	Fossil carbon fraction in % of total carbon
Paper/cardboard	1
Textiles	20
Food waste	-
Wood	-
Garden and Park waste	0
Rubber	20
Plastics	100
Metal	NA
Glass	NA
Other, inert waste	100

Data / Parameter:	**EF**
Data unit:	fraction
Description:	Combustion efficiency for waste
Source of data to be used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 5, Table 5.2.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100%. No country or project specific data are available. Therefore, using 2006 IPCC Guidelines for default value.
Description of measurement methods and procedures to be applied:	To be carried out annually
QA/QC procedures to be applied:	As per guidance from the Board, IPCC default values should be used only when country or project specific data are not available or difficult to obtain.
Any comment:	-

Data / Parameter:	**MB_y**
Data unit:	tCH_4
Description:	Methane produced in the landfill in the absence of the project activity in year y
Source of data to be used:	Calculated as per the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
Value of data applied for the purpose of calculating expected emission reductions in section B.5	(see table below)
Description of measurement methods and procedures to be applied:	As per the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
QA/QC procedures to be applied:	As per the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
Any comment:	-

Year	MB_y (tco_2e)
1	45,729
2	77,798
3	100,618
4	117,149
5	129,383
6	138,660
7	145,883
8	151,663
9	156,414
10	160,417

Data / Parameter:	**$EG_{d,y}$**
Data unit:	MWh
Description:	Amount of electricity generated from incineration in the project activity displacing electricity in the baseline during the year y
Source of data to be used:	Electricity meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	87,703
Description of measurement methods and procedures to be applied:	The electricity supplied to the grid will be continuously measured.
QA/QC procedures to be applied:	Payment invoices made to the grid operator and payment receipts together with the meter reading records will be used to verify the energy exported to the grid. This data will be crosschecked on a regular basis between the metering devices at

	the Project stations to assure consistency, accuracy and transparency.
Any comment:	-

Data / Parameter:	**CEF_d**
Data unit:	tCO_2/MWh
Description:	Emission factor of displaced electricity by the project activity
Source of data to be used:	As per the “Tool to calculate the emission factor for an electricity system”
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.7691
Description of measurement methods and procedures to be applied:	This parameter will be calculated once for each crediting period.
QA/QC procedures to be applied:	As per the “Tool to calculate the emission factor for an electricity system”
Any comment:	This parameter is also referred to as CEF_{elec} in this document.

Data / Parameter:	**$RATE^{Compliance}_{y}$**
Data unit:	Number
Description:	Rate of compliance
Source of data to be used:	Municipal bodies
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	The compliance rate is based on the annual reporting of the municipal bodies issuing these reports. The state-level aggregation involves all landfill sites in the country. If the rate exceeds 50%, no CERs can be claimed. Monitored annually.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	**$A_{residual}$**
Data unit:	tonnes/yr
Description:	The amount of the residual waste from the incinerator
Source of data to be used:	Measured by project participants
Value of data applied for the purpose of calculating expected	44,550

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Monitored by weighbridge. Aggregated at least annually
QA/QC procedures to be applied:	-
Any comment:	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier)

Data / Parameter:	**$FC_{residual}$**
Data unit:	%
Description:	Fraction of residual carbon in the residual waste of MSW incinerator
Source of data to be used:	Sample measurements by project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	3%
Description of measurement methods and procedures to be applied:	The size and frequency of sampling should be statistically significant with a maximum uncertainty range of 20% at a 95% confidence level. As a minimum, sampling should be undertaken four times per year.
QA/QC procedures to be applied:	
Any comment:	-

Data / Parameter:	**$Q_{COD,y}$**
Data unit:	m^3/yr
Description:	Amount of wastewater treated anaerobically in year y
Source of data to be used:	Measured value by flow meter.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	44,550
Description of measurement methods and procedures to be applied:	Monthly aggregated annually
QA/QC procedures to be applied:	The monitoring instruments will be subject to regular maintenance and testing to ensure accuracy
Any comment:	-

Data / Parameter:	$P_{COD,y}$
Data unit:	$tCOD/m^3$
Description:	Chemical Oxygen Demand (COD) of wastewater
Source of data to be used:	Measured value by purity meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.06
Description of measurement methods and procedures to be applied:	Monthly and averaged annually
QA/QC procedures to be applied:	The monitoring instruments will be subject to regular maintenance and testing to ensure accuracy.
Any comment:	-

Data / Parameter:	-
Data unit:	MJ
Description:	Energy generated by auxiliary fossil fuel added in the incinerator
Source of data to be used:	Project site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Estimated annually. This parameter will be estimated multiplying the amount of auxiliary fossil fuel added in the incinerator to the net calotific value of this auxiliary fossil fuel
QA/QC procedures to be applied:	-
Any comment:	This parameter will be used to assess that the fraction of energy generated by fossil fuel is no more than 50% of the total energy generated in the incinerator. Energy generated by fossil fuel <0.50x $(Q_y+EG_{d,y})$

B.7.2. Description of the monitoring plan:

Purpose

The monitoring plan is designed to monitor parameters listed in B.7.1, which are required for calculation of the actual GHG emission reduction achieved by the Project.

1. Monitoring framework

The project owner will form an operational and management team, which will be responsible for monitoring of all the aforementioned monitoring parameters. The team will composed of a general manager and a group of operators. The monitoring organization is shown below.

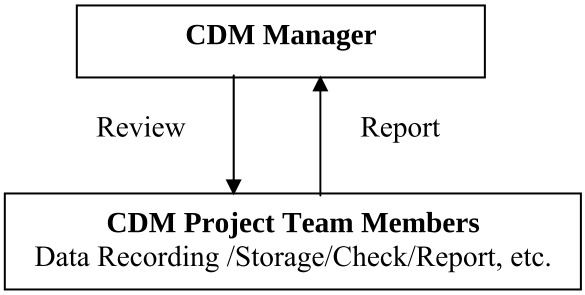

Figure B.7.2-1 Project Monitoring Organization

CDM Manager-responsible for the monitoring plan and supervise the collected data and will be the main contact person for DOE, Chinese DNA, carbon buyers, consultants as well as related local authorities, etc., during the crediting period.

CDM Project Team-under the supervision of the CDM manager, responsible for monitoring of different parameters on a timely basis and will perform the recording and archiving of data in an orderly manner.

2. Monitoring methods and equipments for the required parameters

The main monitoring data include the amount and composition of MSW, electricity generation by the Project activity, auxiliary fuel consumption, etc. All the data listed in the B7.1 should be monitored according to the monitoring methodologies for each is stated in the respective sections of B.7.2. The main monitoring point and monitoring parameters shows below.

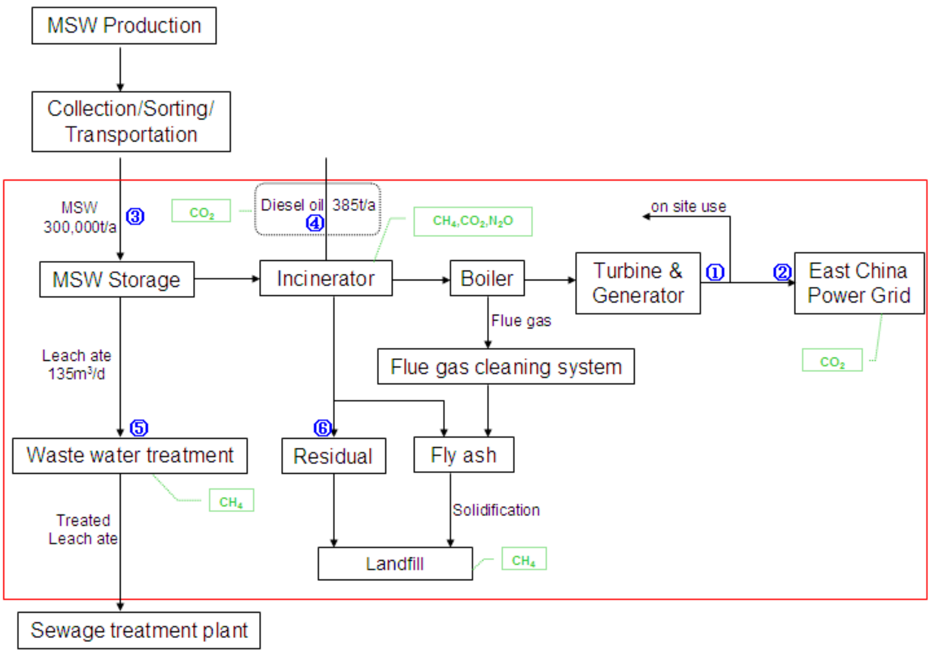

Fig B.7.2-2 Monitoring Point

Table B.7.2-1 Monitoring point and parameters need to be monitored

Monitoring Point	Parameters Monitored	Equipment Used
Monitoring point ①	Electricity delivered to and imported from the grid recorded by C&G Environmental Protection (Fuqing) Co., Ltd	Electricity meter
Monitoring point ②	Electricity delivered to and imported from the grid recorded by the Electric Power Company	Electricity meter
Monitoring point ③	Amount of MSW consumed in the project	Weighbridge
	Waste component	Sample measurement
	Fraction of fossil carbon in total carbon of waste	Sample measurement
Monitoring point ④	Fuel consumption on-site	Metering
Monitoring point ⑤	Amount of wastewater treated anaerobically	Flow meter
	Chemical Oxygen Demand (COD) of wastewater	Purity meter
Monitoring point ⑥	Amount of residual waste from incinerator	Weighbridge
	Carbon content of residual waste from incinerator	Sample measurement

1) Electricity exported to the grid ($EG_{d,y}$) and electricity imported from the grid ($EG_{PJ,FF,y}$) by the project activity in year y :

$EG_{d,y}$ and $EG_{PJ,FF,y}$ will be continuously monitored by the main meter recorded by the grid company and will be cross checked with the recordings from the meter recorded by the project owner. The electricity meter will be calibrated by qualified organization and the accuracy of the meter is at least 0.5S. In addition, the electricity sales invoices of every month could be archived. The electricity metering equipment will be properly configured and the metering equipment will be checked by both the project owner and the grid company according to the Chinese national standard "Technical Management Code for Electricity Metering" (DL/T448-2000) before the project operation.

2) The amount of MSW consumed by the Project in year y (A_{MSW}, $Q_{bilmass,y}$, or W_x):

The amount of MSW consumed by the Project will be measured by weighbridge. The weighbridge will be installed at the entrance of the plant. The weight of each waste truck entering the pant will be recorded automatically. The weighbridge will be calibrated as per the methodology, or the local government requirement, or manufacturers' specifications, etc.

3) Waste component of the different waste type ($p_{n, j, y}$):

It will be monitored by sampling the received waste, using the waste category j, as provided in IPCC, and calculated by the total amount of MSW multiplying the annual average of each waste fraction. The sampling and analyzing of each waste fraction will be done at least four times per year by a qualified lab according to relevant national/sector standards, such as *Sampling and physical analysis methods for municipal domestic waste*[54]. For each sample, the size and frequency should be statistically significant with a maximum uncertainty range of 20% at a 95% confidence level.

4) Fraction of fossil carbon in total carbon of waste type i (FCF_i)

It will be monitored by sampling the received waste. The sampling and analysing of each waste fraction will be done at least four times per year by a qualified lab according to the following standards: ASTM D6866-08: "Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis"; and Standard Practice for Collection of Integrated Samples for the Speciation of Biomass (Biogenic) and Fossil- Derived Carbon Dioxide Emitted from Stationary Emissions Sources". The size and frequency of sampling should be statistically significant with a maximum uncertainty range of 20% at a 95% confidence level.

5) The amount of residue waste from incinerator ($A_{residue}$)

The weight of residual waste will be measured by weighbridge. The data will be collected monthly.

6) The carbon content of residue waste from incinerator ($FC_{residue}$)

It will be monitored by sampling the received residue waste. The sampling and analyzing of carbon content of residue waste will be done at least four times per year by a qualified lab according to relevant national/sector standards. The size and frequency of sampling should be statistically significant with a maximum uncertainty range of 20% at a 95% confidence level.

7) The quantity of fuel consumption on-site during year y of the crediting period ($F_{cons, y}$)

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[54] http://wenku.baidu.com/view/34f42385b9d528ea81c779c4.html

Diesel oil will be used during the start-up or the combustion temperature is lower than 850℃ as well as vehicles used on site. The consumption will be measured by metering. The data will be crosschecked with the purchase invoice of the diesel oil.

8) Laws and regulations regarding MSW treatment in China, reports published by authorities (such as statistical yearbook, IPCC Guidelines and so on) will be archived. Check and update the default value used to the project if necessary.

3. Calibration of monitoring equipment

Regular calibration will be necessary for the monitoring equipments. The necessary calibration will be performed according to the manufacturer's guidelines, or according to the applicable regulations, by a suitably skilled technician at the required frequency. A certificate of calibration will be provided for each piece of equipment after completion. The calibration records will be archived by the project owner for the DOE verification.

4. Disposing process due to abnormity and errors

If the weighbridges and electricity metering systems do not function properly, the monitoring process should be:

- Dispose of according to the relevant terms in the MSW treatment contract and electricity sales and purchase contract.

- If the project participants and the relevant parties fail to agree the measuring methods, then the matter will be referred for arbitration according to the contract.

5. Data collection and management

The data recorded by the monitoring equipment will be aggregated. The relevant receipt for electricity sales and tipping fee and the invoices of electricity purchase and fuel purchase should be preserved.

All data involved in monitoring plan will be collected and summed up by the CDM manager and CDM team of the proposed project. The data records will be kept for at least 2 years after the end of the crediting period.

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

The study of the baseline and monitoring methodology was concluded on 24/03/2011.

Name of person/entity determining the baseline:

Hangzhou Carbon Trade Environment Engineering Co., Ltd

Room 1525 of Buynow Keji Mansion No.23 Jiaogong Rd, West Lake District, Hangzhou City, Zhejiang Province, China.

Contact person：Tina Wang

Tel: +86 0571 5683 4629

Fax: +86 0571 5683 4630

Email: wmn1432000@yahoo.com.cn

The entity is not one of the Project Participants listed in Annex 1 of the document.

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:

03/07/2010 (the date of EPC contract signed) is used as the starting date of the project activity.

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

23 years.

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

C.2.1. Renewable crediting period:

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

N/A

C.2.1.2. Length of the first crediting period:

N/A

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/09/2012 or registration date whichever is later.

C.2.2.2. Length:

10 years.

SECTION D. Environmental impacts

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

The *Environmental Impact Assessment Report* of the Project was approved by Fujian Environmental Protection Bureau on June 16th 2009. In China, the compilation of EIA report is strictly complied with the "EIA Classification Management Directory of Construction Project[55]" issued by *The Central People's Government of the People's Republic of China*. Based on the Directory, the waste incineration project is classified into Category E (Electricity) Item 2 (Biomass power generation). The *EIA Report* was completed by Guizhou Environmental Protection Science Research & Design Institute which is a certified organization independent of the project owner. According to the *Environmental Impact Assessment Report*, the environment impacts possibly caused by the Project and the corresponding mitigating measures adopted by the Project are analyzed as following two phases:

Air Pollution

Construction Stage-The main air pollutant is the dust generated from digging and transportation. Measures will be taken to mitigate the pollutant such as spraying water at bare ground, digging area and temporary abandon area; backfilling or removing the excavation earthwork; selecting new clean construction machinery as far as possible.

Operational Stage- The main pollutants contained in the exhaust gas from incinerator are dust, acid gas (HCl, HF, SOx, NOx), heavy metal (Hg, Pb, Cr) and toxic pollutant (dioxin, furans). The proposed project will adopt flue gas cleaning system which include lime system, spray dry reaction tower system, bag-type dust elimination, active carbon system and slag transportation system.

(1) Prevention and control of the gas

Bag filter does well in the removal of organic pollutants and heavy metal and its dust removal efficiency is greater than 99%, which can meet the requirements of the prevention and control of the project gas.

(2) Prevention and control of the acid gas

The project adopts half dry cleaning technology, which combines the half dry reaction tower and bag filter. The burning gas of incinerator goes into the reaction tower after heat recovery by the waste heat boiler. Reaction with the lime slurry, the burning gas removes the acid gas (such as HCl, SO_2 and HF) to meet the requirements of the prevention and control of acid gas.

(3) Prevention and control of the dioxin

At first, incineration technologies can avoid the generation of dioxin, which can fully stir and mix the garbage to insure uniform and complete combustion. What's more, it can also control the retention time of the furnace gas more than two seconds under the condition of over 800℃ to insure the full decomposition of the dioxin. Likewise, the regeneration of the dioxin can be reduced. In addition, inject the activated carbon into the flue gas pipeline following the reaction tower to absorb the dioxin. Then, the gas will be processed in the bag filter to insure the sufficient adsorption. As measures taken above, the dioxin emitting concentration of the project waste gas are expected to be lower than 0.1ngTEQ/m^3, up to the national standard.

[55] http://www.gov.cn/flfg/2008-09/05/content_1088471.htm

(4)Prevention and control of the heavy metal
Generally, heavy metal exists in the flue gas in the form of solid and gas. The project adopts the process of “half dry reaction tower, activated carbon adsorption and bag filter” to deal with the heavy metal. Thus, the discharge of the heavy metal in the flue gas would meet the requirements of the control standards of the life waste incineration pollutant (GB18485-2001).

(5)Prevention and control of the NOx
The generation of NOx should be inhibited by burning control, and use the SNCR denitrification system device can prevent and control the NOx.

Furthermore, the slight stink of MSW will be generated from the MSW storage pool. The air in the pool will be extracted as the combustion air, which can make the hall in negative pressure status, to avoid stink overflow.

Waste Water Pollution
Construction Stage-Waste water during the construction period is mainly domestic waste water. It will be treated through waste water treatment equipment and then discharged.

Operational Stage-Water pollution generated during the incineration process is mainly leachate, domestic and industrial waste water. The leachate will be pre-treated by waste water treatment facilities to ensure that national standards are met and then discharged into the sewage treatment plant. The domestic and industrial waste water will be discharged into the sewage treatment plant through the municipal sewage network.

Noise Pollution
Construction Stage-The recourse of the noise during the construction period is vehicles and various construction machines. Anti-noise measures such as planting and mufflers device will be taken to ensure the noise meet the national standards.

Operational Stage-The main noise sources are equipments including incinerators, waste-heat boiler, steam turbine generators and various auxiliary equipments such as pumps, blowers and so on. The mitigation measures are: installation in-site noise barriers and considering noise-reducing measures in plant construction.

Solid Waste Pollution
There are two main solid waste generated in the proposed project, slag and fly ash. Based on the rules of “Solid Waste Incineration Pollution Control Standard” (GB18485-2001), the slag generated during the incineration process is treated as common solid waste and will be transported to the landfill, while the fly ash is identified as dangerous solid waste. Thus, the slag can be send to the landfill. The fly ash will be pre-treated by mixing cement and chelating agents, the efficiency is up to 97%. The fly ash will be send to landfill site after passing the leaching toxicity test conducted by legal authorities, which shall comply with the requirements specified in the “Solid Waste Incineration Pollution Control Standard” (GB18485-2001), “Solid Waste Landfill Pollution Control Standard” (GB168889-2008), “Pollution Control Standards for the Storage of Hazardous Waste” (GB18597-2001), and “Pollution Control Standard for Hazardous Waste Landfill” (GB18598-2001).

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:

Environmental impacts of the Project are not considered significant.

SECTION E. Stakeholders' comments

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

Local residuals were invited to take part in the stakeholder meeting held by the project developer on February 2010. A questionnaire survey was carried out during the meeting. The participants expressed fully their comments and concerns about the most relative and sensitive questions of the proposed project. The main content of the questionnaires include:

- How much do the stakeholders know the Project;
- The positive and negative effects caused by the construction and operation of the Project;
- Advantages and disadvantages to local development;
- The attitude of the stakeholders to the construction of the project;
- The effect of CDM mechanism to the proposed project.

There are 50 questionnaires were returned at last, with 100% response rate. The details of the stakeholders for the project are summarized as follows.

Table E1-1 The details of the stakeholders for the Project

Item	vocation	total	percentage
Education level	preliminary school	17	34%
	Junior high school	20	40%
	Senior high school	10	20%
	junior college and above	3	6%
Occupation level	Farmer	32	64%
	Worker	13	22%
	Doctor	2	4%
	Student	3	6%

Table E.1-2 The results of the survey

Content		Statistical Results	
1. How much do you know about this	Very clear	6	12%

project?	Clear	44	88%
	Never heard	0	0
2. Are you satisfied with the current environment status?	Satisfied	50	100%
	Not satisfied	0	0
3. How do you consider the site selection of the project?	Reasonable	48	96%
	Not reasonable	0	0
	No care	2	4%
4. What do you think about the main environmental pollutions generated by the project?	Air pollution	2	4%
	Water pollution	1	2%
	Noise pollution	0	0
	Solid waste pollution	0	0
	Eco-environment	0	0
	No large influence	47	94%
5. What's your opinion about effects of the project on local economic development and life improvement of local residents?	Positive effect	46	92%
	Little effects	4	8%
	No effects	0	0
6. What do you think about the impact of the project construction to local ecological conditions?	Improve	47	94%
	Destroy	0	0
	No change	3	6%
7. What's your attitude to the project?	Support	50	100%
	Objective	0	0
	Indifference	0	0
8. How do you think the effect of CDM mechanism to the project?	Promote the project	41	82%
	Enhance the enthusiasm to use clean energy for generation	5	10%
	Not clear	4	8%

E.2. Summary of the comments received:

Based on 50 questionnaires, the summary of the comments are listed as follows:

1) All of the respondents know the proposed project and think the site selection is reasonable;

2) 94% of the respondents think that there are no significant environmental pollution generated from the construction of the project and 4% worried about the air pollution of the proposed project, 2% worried about the water pollution of the proposed project;

3) All of the respondents support the operation of the proposed project and 92% believe that the Project will contribute to the development of local economy and the improvement of the residents' life. 94% of the respondents think the project will improve the local ecological environmental conditions;

4) 92% of the respondents think the CDM mechanism has positive effect on the proposed project.

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

According to the results of the questionnaires, all of the respondents support the operation of the proposed project and most of them think the project has positive effects on local development. The main concern on environmental pollutions generated by the project is air and water pollution. The project owner feedback seriously and take proper action to guarantee that the project has the minimum negative impact on the environment during construction and operation of the Project.

✓ Air pollution: The project will adopt effective gas purification processing combined of semi-dry flue gas cleaning system and bag-type dust elimination to ensure the concentration of the pollutants fall within the national standards required;

✓ Water pollution: The main water pollution is leachate generated from waste storage pool in the plant. The leachate will be firstly treated by waste water treatment facilities to ensure that national standards are met and then discharged into the sewage treatment plant. The leachate will not discharge into nearby water body. Other waste water such as domestic and industrial waste water will be treated in the plant waste water disposal station and discharged into the sewage treatment plant, so the water pollution is insignificant.

Annex 1

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

Data recommended in the 2010 Baseline Emission Factors for Regional Power Grids in China for the East China Power Grid is adopted for the Project.

Tables A3-1 Fossil Fuel-fired Power Generation of ECPG in 2008

Regions	Power Generation	Electricity Generation	Rate of Electricity Consumption	Electricity Supply to Grid
	（10^8kWh)	（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
An'hui	1074	107,400,000	5.72	101,256,720
Fujian	748	74,800,000	5.61	70,603,720
Total				670,529,910

Power Import from Yangcheng Power Plant (MWh)	16,903,640
Emission Factor of CO_2 for Yangcheng Power Plant	1.004945
Power Import from CCG(MWh)	35,684,610
Simple OM of CCG	1.04205
Total CO_2 **emission**	609,724,008
Total power supply of ECG	723,118,160
Emission Factor	0.84319

Data source: China Electric Power Yearbook 2009

Table A3-2 Calculate the Operating Margin Emission Factor of ECPG in 2008

Fuel	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Subtotal	Carbon Content	Oxidation	Emission factor	LHV	CO_2 emission(tCO_2e)
								(tc/TJ)	(%)	($kgCO_2$/TJ)	（MJ/t,km3)	K=F×I×J/100000(mass)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F×I×J/10000 (Volume)
Raw Coal	10^4t	2964.04	10890.2	7316.17	4887.18	3264.88	**29322.47**	25.8	100	87,300	20,908	535,213,779
Cleaned Coal	10^4t						**0**	25.8	100	87,300	26,344	0
Other Washed Coal	10^4t		513.34		33.49		**546.83**	25.8	100	87,300	8,363	3,992,351
Moulded coal	10^4t						**0**	26.6	100	87,300	20,908	0
Coke	10^4t			31.12			**31.12**	29.2	100	95,700	28,435	846,847
Coke Oven Gas	10^8m^3	0.5	11.65	0.13	5.62	0.31	**18.21**	12.1	100	37,300	16,726	1,136,085
Other Gas	10^8m^3	98.42	77.84	3.57		6.36	**186.19**	12.1	100	37,300	5,227	3,630,092
Crude Oil	10^4t			8.31			**8.31**	20	100	71,100	41,816	247,066
Gasoline	10^4t						**0**	18.9	100	67,500	43,070	0
Diesel Oil	10^4t	5.85	4.04	2.05		1.04	**12.98**	20.2	100	72,600	42,652	401,930
Fuel Oil	10^4t	24.43	0.39	13.48		1.81	**40.11**	21.1	100	75,500	41,816	1,266,316
PLG	10^4t						**0**	17.2	100	61,600	50,179	0
Refinery Gas	10^8m^3	0.05	0.28		1.5	0.57	**2.4**	15.7	100	48,200	46,055	53,276
Nature gas	10^4t	3.65	25.14	8.99		0.19	**37.97**	15.3	100	54,300	38,931	8,026,681
Other Coking Products	10^4t	21.33	3.09				**24.42**	20	100	72,200	41,816	737,268
Other Petroleum Products	10^4t						**0**	25.8	100	95,700	28,435	0
Other Energy	10^4tce	15.88	62.57	34.54		8.99	**121.98**	0	0	0	0	0
											Total	555,551,691

Data source: China Electric Power Yearbook 2009

Table A3-3 Fossil Fuel-fired Power Generation of ECPG in 2007

Regions	Power Generation	Electricity Generation	Rate of Electricity Consumption	Electricity Supply to Grid
	(10^8kWh)	（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
An'hui	848	84,800,000	5.92	79,779,840
Fujian	723	72,300,000	5.59	68,258,430
Total				635,331,510

Power Import from Yangcheng Power Plant (MWh)	12,773,620
Emission Factor of CO_2 for Yangcheng Power Plant	0.97254
Power Import from CCG(MWh)	31,823,310
Simple OM of CCG	1.10197
Total CO_2 **emission**	582,797,035
Total power supply of ECG	679,928,440
Emission Factor	0.85710

Data source：The China Energy Statistical Yearbook 2008

Table A3-4 Calculate the Operating Margin Emission Factor of ECPG in 2007

Fuel	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Subtotal	Carbon Content	Oxidation	Emission factor	LHV	CO_2 emission(tCO_2e)
								(tc/TJ)	(%)	($kgCO_2$/TJ)	（MJ/t,km3)	K=F×I×J/100000(mass)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F×I×J/10000 (Volume)
Raw Coal	10^4t	2754.04	11060.78	7350	3929.9	3097.87	**28192.59**	25.8	100	87300	20908	514590436.4
Cleaned Coal	10^4t						**0**	25.8	100	87300	26344	0
Other Washed Coal	10^4t		459.17		29.32		**488.49**	25.8	100	87300	8363	3566416.153
Moulded coal	10^4t						**0**	26.6	100	87300	20908	0
Coke	10^4t			35.06			**35.06**	29.2	100	95700	28435	954063.0627
Coke Oven Gas	10^8m^3	0.89	9.73	0.22	1.56	0.75	**13.15**	12.1	100	37300	16726	820401.937
Other Gas	10^8m^3	98.92	70.45	3.41	36.3	1.71	**210.79**	12.1	100	37300	5227	4109711.501
Crude Oil	10^4t			15.15			**15.15**	20	100	71100	41816	450427.3164
Gasoline	10^4t						**0**	18.9	100	67500	43070	0
Diesel Oil	10^4t	1.23	5.37	2.76		1.01	**10.37**	20.2	100	72600	42652	321110.7002
Fuel Oil	10^4t	40.76	1.55	29.52		2.04	**73.87**	21.1	100	75500	41816	2332155.68
PLG	10^4t						**0**	17.2	100	61600	50179	0
Refinery Gas	10^8m^3	0.2	0.63		2.55		**3.38**	15.7	100	48200	46055	75030.9638
Nature gas	10^4t	4.61	19.17	11.01			**34.79**	15.3	100	54300	38931	7354443.531
Other Coking Products	10^4t	20.39	2.78				**23.17**	20	100	72200	41816	699528.9918
Other Petroleum Products	10^4t						**0**	25.8	100	95700	28435	0
Other Energy	10^4tce	6.89	28.88	44.93	7.52	9.43	**97.65**	0	0	0	0	0
											Total	535273726.2

Data source：The China Energy Statistical Yearbook 2008

Table A3-5 Fossil Fuel-fired Power Generation of ECPG in 2006

Regions	Power Generation	Electricity Generation	Rate of Electricity Consumption	Electricity Supply to Grid
	（10^8kWh)	（MWh)	（%）	（MWh)
Shanghai	720.33	72,033,000	5.06	68,388,130
Jiangsu	2512.58	251,258,000	5.69	236,961,420
Zhejiang	1403.49	140,349,000	5.62	132,461,386
An'hui	718.67	71,867,000	6.05	67,519,047
Fujian	555.8	55,580,000	4.51	53,073,342
Total				558,403,325

Power Import from Yangcheng Power Plant (MWh)	11,150,820
Emission Factor of CO_2 for Yangcheng Power Plant	0.997019
Power Import from CCG(MWh)	24,029,150
Simple OM of CCG	1.12157
Total CO_2 **emission**	523,088,697
Total power supply of ECG	593,583,295
Emission Factor	0.88124

Data source: China Electric Power Yearbook 2007

Table A3-6 Calculate the Operating Margin Emission Factor of ECPG in 2006

Fuel	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Subtotal	Carbon Content	Oxidation	Emission factor	LHV	CO_2 emission(tCO_2e)
								(tc/TJ)	(%)	($kgCO_2$/TJ)	（MJ/t,km3)	K=F×I×J/100000(mass)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F×I×J/10000 (Volume)
Raw Coal	10^4t	2744.45	10945.42	6065	3455.2	2369.63	**25579.7**	25.8	100	87300	20908	466898180.9
Cleaned Coal	10^4t						**0**	25.8	100	87300	26344	0
Other Washed Coal	10^4t		150.54		23.06		**173.6**	25.8	100	87300	8363	1267436.066
Moulded coal	10^4t						**0**	26.6	100	87300	20908	0
Coke	10^4t			39.07			**39.07**	29.2	100	95700	28435	1063184.366
Coke Oven Gas	10^8m^3	1.71	3.13	0.23	0.71		**5.78**	12.1	100	37300	16726	360602.5244
Other Gas	10^8m^3	84.64	106.54	3.28	25.12		**219.58**	12.1	100	37300	5227	4281087.582
Crude Oil	10^4t			20.3			**20.3**	20	100	71100	41816	603542.8728
Gasoline	10^4t						**0**	18.9	100	67500	43070	0
Diesel Oil	10^4t	2.13	3.7	4.11	1.21	1.11	**12.26**	20.2	100	72600	42652	379635.2155
Fuel Oil	10^4t	44.51	3.77	71.98	0.02	4.5	**124.78**	21.1	100	75500	41816	3939439.362
PLG	10^4t						**0**	17.2	100	61600	50179	0
Refinery Gas	10^8m^3	0.29	0.4		2.95		**3.64**	15.7	100	48200	46055	80802.5764
Nature gas	10^4t	3.2	13.5	9.18			**25.88**	15.3	100	54300	38931	5470911.14
Other Coking Products	10^4t	18.82	3.57				**22.39**	20	100	72200	41816	675979.8933
Other Petroleum Products	10^4t						**0**	25.8	100	95700	28435	0
Other Energy	10^4tce	6.66	2.8	27.45	3.21		**40.12**	0	0	0	0	0
											Total	485020802.5

Data source：The China Energy Statistical Yearbook 2007

Table A3-7 The Operating Margin Emission Factor of ECPG in 2006~2008

	2006	2007	2008	Weighted mean of 2006-2008
Emission factor (tCO_2/MWh)	0.88124	0.85710	0.84319	0.85924

Table A3-8 $EF_{Coal, Adv}$, $EF_{Oil, Adv}$ and $EF_{Gas, Adv}$

	Variation	Efficiency of power supply (%)	Fuel EF ($kgCO_2$/TJ)	Oxidation rate	Emission factor (tCO_2/MWh)
		A	B	C	D=3.6/A/10,000×B×C
Coal-fired power plant	$EF_{Coal,Adv,y}$	39.08	87,300	1	0.8042
Oil-fired power plant	$EF_{Oil,Adv,y}$	51.46	75,500	1	0.5282
Gas-fired power plant	$EF_{Gas,Adv,y}$	51.46	54,300	1	0.3799

Table A3-9 Calculation of Ratio of Solid, Liquid and Gas fuel in total CO_2 Emissions

		Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	NCVi	$EFCO_2$,i	OXIDi	Emission of CO_2(tCO_2e)
Fuel	Unit	A	B	C	D	E	G=A+…+E	H	I	J	K=G×H×I×J/100,000
Raw coal	10^4t	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
Cleaned coal	10^4t	0	0	0	0	0	0.00	26,344	87,300	1	0
Other washed	10^4t	0	513.34	0	33.49	0	546.83	8,363	87,300	1	3,992,351
Moulded coal	10^4t	0	0	0	0	0	0.00	20,908	87,300	1	0
Coke	10^4t	0	0	31.12	0	0	31.12	28,435	95,700	1	846,847
Other coke products	10^4t	0	0	0	0	0	0.00	28,435	95,700	1	0
Total											540,052,976
Crude oil	10^4t	0	0	8.31	0	0	8.31	41,816	71,100	1	247,066
Gasoline	10^4t	0	0	0	0	0	0	43,070	67,500	1	0
Disesel	10^4t	5.85	4.04	2.05	0	1.04	12.98	42,652	72,600	1	401,930
Fuel oil	10^4t	24.43	0.39	13.48	0	1.81	40.11	41,816	75,500	1	1,266,316
Other oil products	10^4t	21.33	3.09	0	0	0	24.42	41,816	72,200	1	737,268
Total											2,652,580
Natural gas	10^8m3	36.5	251.4	89.9	0	1.9	379.7	38,931	54,300	1	8,026,681
Coke oven gas	10^8m3	5	116.5	1.3	56.2	3.1	182.1	16,726	37,300	1	1,136,085
Other coal gas	10^8m3	984.2	778.4	35.7	0	63.6	1861.9	5,227	37,300	1	3,630,092
Liquefied Petroleum	10^4t	0	0	0	0	0	0	50,179	61,600	1	0
Refinery gas	10^4t	0.05	0.28	0	1.5	0.57	2.4	46,055	48,200	1	53,276
Total											12,846,135
											555,551,691

Data Source: China Energy statistical Yearbook 2009

Thus $\lambda_{Coal,y}$ =97.21%，$\lambda_{Oil,y}$ =0.48%，$\lambda_{Gas,y}$ =2.31%

$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,\ Adv,y} + \lambda_{Oil,y} \times EF_{Oil,\ Adv,y} + \lambda_{Gas,y} \times EF_{Gas,\ Adv,y} =$ 0.7931 tCO_2/MWh

Table A3-10 The Installed Capacity of ECPG in 2008

Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Fuel-fired power	MW	16,780	50,680	40,990	24,820	15,430	148,700
Hydropower	MW	0	1,140	8,960	1,560	10,580	22,240
Nucleus power	MW	0	2,000	3,070	0	0	5,070
Wind power and others	MW	40	610	150	0	260	1,060
Total	MW	16,820	54,420	53,170	26,380	26,270	177,070

Data source： China Energy Statistical Yearbook 2009

Table A3-11 The Installed Capacity of ECPG in 2007

Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Fuel-fired power	MW	14,150	53,340	39,490	17,760	13,910	138,650
Hydropower	MW	0	140	8,520	1,510	9,800	19,970
Nucleus power	MW	0	2,000	3,070	0	0	5,070
Wind power and others	MW	268,8	517,8	40	0	269	1,095.6
Total	MW	14,418.8	55,997.8	51,120	19,270	23,979	164,785.6

Data source： China Energy Statistical Yearbook 2008

Table A3-12 The Installed Capacity of ECPG in 2006

Capacity	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total
Fuel-fired power	MW	14,526	51,776	35,391	14,134	13,001	128,828
Hydropower	MW	0	136	8,369	1,001	8,957	18,463
Nucleus power	MW	0	0	3,066	0	0	3,066
Wind power and others	MW	253	162	43	0	89	547
Total	MW	14,779	52,074	46,869	15,135	22,047	150,904

Data source： China Energy Statistical Yearbook 2007

Table A3-13 The Calculation of BM EF of ECPG

	Installed Capacity of 2006	Installed Capacity of 2007	Installed Capacity of 2008	New Additions from 2006 to 2008	New Additions from 2007 to 2008	Cumulative increase (%)
	A	B	C	D*	E*	F
Fuel-fired power(MW)	128,828	138,650	148,700	32,640	18,116	85.60%
Hydropower(MW)	18,463	19,970	22,240	2,972	1,336	7.80%
Nucleus power	3,066	5,070	5,070	2,004	0	5.26%
Wind power and others (MW)	547	1,096	1,060	513	-36	1.35%
Total(MW)	150,904	164,786	177,070	38,129	19,416	100.00%
Share in total installed capacity of 2008				21.53%	10.97%	

- Considering installed capacity, capacity for shutdown power units and capacity for pumped storage power units.

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

Annex 4

MONITORING INFORMATION

No other additional information.

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