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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

Controlled combustion of municipal solid waste (MSW) and energy generation in Linyi City, Shandong, China (the Project activity or the Project)
(Version 1.0, 28/09/2007)

A.2. Description of the project activity:

The Project activity involves the controlled combustion of municipal solid waste (MSW) to generate electricity and heat in Linyi City, Shandong Province, China. Linyi National Environmental New Energy Co., Ltd., will install and operate two waste-combustion fluid-bed boilers with rated steam capacities of 75t/hour, and each able to deal with 400t/day of MSW to achieve this. The MSW to be used in the project would have been disposed of at the Linyi Landfill Site for MSW Sanitation Treatment, built in 1999, and capable of dealing with 900 tons/day of MSW over its projected 25-year lifespan. The Linyi Landfill Site does not currently have a gas capture system installed, a Chinese regulatory requirement[1]; however, compliance with this regulation is not commonplace in China. Should compliance with this regulation exceed 50% during the project activity, the project activity will no longer be able to claim CERs for methane avoidance.

The waste will be co-combusted with coal in order to ensure complete firing of the waste. Steam produced by the boilers will feed into a 25MW steam turbine-generator which is expected to generate 168,300MWh/yr of electricity for use on site and for export to the North China Power Grid. The project is also expected to produce 912,000 GJ/yr of thermal energy for export to customers in a nearby wood-processing industrial park.

The 800 tonnes per day of MSW that the project is to incinerate would otherwise be landfilled. The project, therefore, contributes to GHG emission reductions by avoiding CH_4 emissions that would have occurred as a result of landfill. It also leads to emission reductions through the displacement of grid electricity, and thermal energy currently produced by boilers at a nearby industrial park.

Total emission reductions over the 7-year crediting period are expected to be in the region of 384,391 tCO_2e.

The project contributes to sustainable development in the local area in a number of ways:

Avoided MSW dumping: In the absence of the project activity the MSW would be landfilled and left to decay in semi-anaerobic conditions, resulting in the release of methane, a potent GHG, and putrid odours.
Job creation: 140 jobs for local people will be created for the construction, operation and maintenance of this project. A number of these staff will receive comprehensive training in the technology to be used by the Project activity.
Development of the country's research and development culture: The technology to be used in this project has been co-designed by the Chinese Academy of Science and Zhonglian

[1] Landfill Technology Codes for MSW, enforced on January 15, 1999, Chinese regulation reference no. CJJ17-88

Environmental Protection Co., Ltd. The boilers will be supplied by Wuxi Huaguang Boiler Plant, a boiler supplier with some of the most advanced domestically produced technology. Given that the design of the technology and building of the plant are occurring within the country itself, should the project prove a success, confidence in the country's R&D abilities would increase.
Renewable energy production, reducing consumption of fossil fuels: The Project will lead to lower emissions of SO_x and NO_x as the activity reduces the use of fossil fuels used in electricity generation. This also contributes to national goals of greater energy security as it reduces the country's need to rely on imports of fossil fuels.

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 a project participant (Yes/ No)
China (host)	**Linyi National Environmental New Energy Co., Ltd(**)**	No
(*) In accordance with the CDM modalities and procedures, at the time of making the 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 private entity 60% owned by China National Environmental Protection Corporation and 40% owned by Eden Investment Co., Ltd. (Hong Kong)		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

China

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

Shandong Province

A.4.1.3. City/Town/Community etc:

Hengyuan, Linyi City

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

Linyi City, situated in the southeast of Shandong Province in P.R. China, covering an area of 409km^2, and with a population of 10 million, is the largest administrative division in the province. The Project activity is located in the northwest of Linyi City. The co-ordinates of the site are: 118º13`46″E, and 35º06`37″N. To the east of the Project site is the Jinghu highway, to the south is the Jucai road, and to the west is an industrial park.

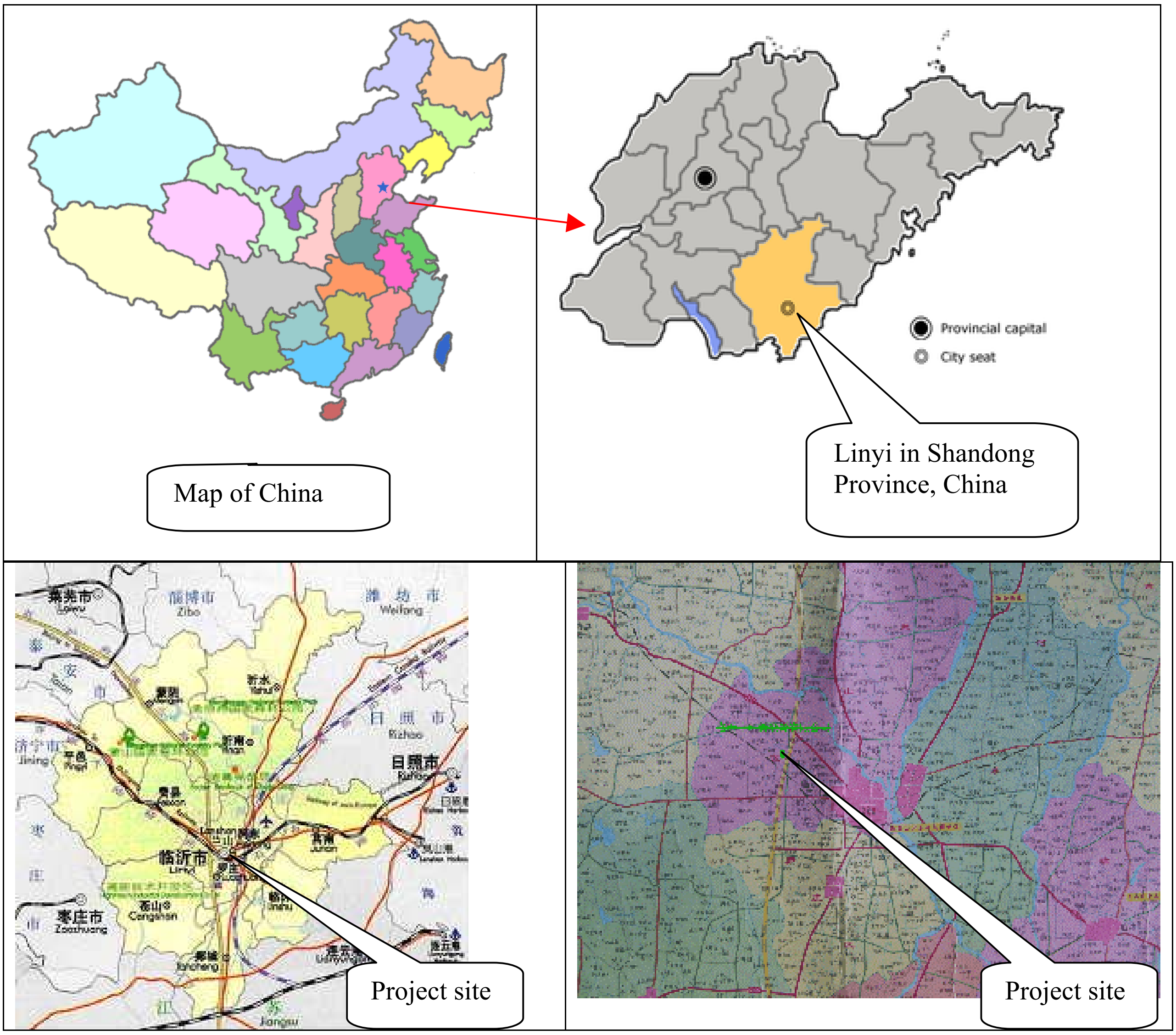

Figure 1. Location of site of Project activity

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

The Project comes under the following category:
Sectoral Scope 1: Energy industry
Sectoral Scope 13: Waste handling and disposal

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

The Project will employ two waste-combustion fluid-bed boilers with rated steam capacities of 75t/hour, and each able to deal with 400t/day of MSW. The steam produced by the boilers will feed into a 25MW steam turbine-generator co-designed by the Chinese Academy of Science and Zhonglian Environmental Protection Co., Ltd. The boilers will be supplied by Wuxi Huaguang Boiler Plant, a boiler supplier with some of the most advanced domestically produced technology.

Turbine (1 set)

Data Item	**Value**
Model	C25-4.9/0.98
Rated steam pressure inflow	4.9 (4.60~5.10) MPa(a)
Rated power	**25 MW**
Maximum power	30 MW
Rated steam extraction pressure	0.98 MPa(a)/300ºC
Steam extraction pressure (scope)	0.785~1.275 MPa(a)
Rated steam extraction volume	70 t/h
Maximum steam extraction volume	130 t/h
Steam flow pressure in rated operating mode	4.194 KPa(a)
Steam consumption in rated operating mode (guarantee value)	6.17 kg/kw.h
Heat consumption in rated operating mode (guarantee value)	8949 kJ/kw.h
Steam flow pressure in condensing operating mode	4.194~4.334 KPa(a)
Steam consumption in condensing operating mode (guarantee value)	4.113 kg/kw.h
Heat consumption in condensing operating mode (guarantee value)	11165 kJ/kw.h
Temperature of fed-in water	153ºC
Rated rotation speed	3000 r/min

Generator (1 set)

Data Item	**Value**
Model	QFW-30-2
Rated voltage	10.5KV
Rated flow	2062A
Rated power	30MW

Power factor	0.8
Rated rotation speed	3000r/min
Frequency	50Hz
States	3
Efficiency	97.4%
Maximum working pressure	0.196 MPa
Temperature of fed-in water	≤ 33ºC
Temperature of air used for cooling	≤ 40ºC
Noise (1 meter from the equipment)	≤ 90dB(A)

CFB boilers (2 sets)

Data Item	**Value**
Model	UG-75/5.29-MT
MSW disposal capacity	**400t/d**
Maximum capacity	**500t/d**
Rated steam capacity	**75t/h**
Flue gas temperature	150ºC
Rated steam temperature	485ºC
Efficiency	81%
Rated steam pressure	5.29MPa
Combustion mode	CFB
Temperature of fed-in water	150ºC
Height of operation layer	7m
Coal	0~10mm
Load range	50~110%
Temperature of air used for cooling	30ºC
MSW disposal rate	525t/d
Coal to support combustion	131t/d
Boiler installation	Semi-outdoor

Pollution control equipment and measures, flue gas filtration and other waste disposal

MSW will be mixed with coal in a 4:1 ratio by weight. The boilers are designed to allow combustion at 860ºC, which will improve the efficiency of MSW combustion, destroy organic pollutants, and limit the production of toxic substances such as dioxins.

The flue gas of this system contains SO_2 and HCl, therefore, an MHGT gas-filtering system will be installed to remove more than 90% of the SO_2, more than 95% of the HCl, and more than 99% of the particulate matter, thereby meeting the Chinese MSW Combustion Pollution Control Code. In addition to this, activated carbon will be used to extract dioxins and heavy metals, and bag filters will be used to remove particulate matter.

Sewage and residue will be treated in order to bring it to within national standards before release into the municipal sewage system.

Leachate from the MSW waiting to be incinerated will be collected and added to the boilers by means of sewage pumps. The energy required to power the pumps will be included in the energy balance of the plant.

An automatic control system (DCS), comprising of a control system, operation system, engineering system, communication network, remote I/O, and spot meters, will be installed to monitor particulate matter, SO_2, HCl, NO_x, O_2, CO, and CO_2 emissions in the flue gas in order to ensure they meet national standards.

The National Emissions Index limits are shown in the following table:

Pollutant	***Emission intensity (mg/m³, unless otherwise stated)***	
	Predicted emission value	***National limit***
SO_2	*160*	*260*
HCl	*30*	*75*
Flue gas particulate matter	*40*	*80*
Dioxin	*0.1ng/m³*	*1ng/m³ (TEQ)*

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

The Project is expected to achieve emission reductions of, on average, 54,913 tCO_2e per year over the chosen renewable seven-year crediting period, leading to a total saving of 384,391 tCO_2e over that period.

Year	Baseline emissions (tCO_2)	Project emissions	Leakage	Emission reductions
Year 1 (2008)	262,412	240,205	0	22,207
Year 2 (2009)	274,382	240,205	0	34,177
Year 3 (2010)	285,680	240,205	0	45,475
Year 4 (2011)	296,327	240,205	0	56,122
Year 5 (2012)	306,386	240,205	0	66,181
Year 6 (2013)	315,857	240,205	0	75,652
Year 7 (2014)	324,782	240,205	0	84,577

A.4.5. Public funding of the project activity:

The financial plans for the Project activity do not involve any public funding from Annex 1 countries.

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:

This section was prepared using AM0025 version 9, "Avoided emissions from organic waste through alternative waste treatment processes"; and referring to ACM0002, "Consolidated methodology for grid-connected electricity generation from renewable sources", version 6; and the latest version of the tool for the demonstration and assessment of additionality.

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

ACM0025 is applicable to projects which involve the combustion of fresh waste which would otherwise be landfilled, to generate electricity and heat.

Specific details as to the applicability of ACM0025 to the Project activity are given below:

- The project activity involves waste treatment option e) for the treatment of fresh waste that in a given year would have otherwise been disposed of in a landfill.

  Fresh waste will be incinerated in a rotating fluidized bed of hearth-type incinerator to produce energy which will be used to replace energy generated from more fossil-fuel intensive sources. In the absence of the Project activity, the waste would be delivered to a landfill and allowed to decompose under anaerobic conditions. There will be no composting of waste under the Project activity.

- In the case of incineration of the waste, 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 stockpiled before combustion for no longer than 10 days. The piling will not be in large enough piles or for a long enough period for anaerobic breakdown to occur to a significant degree.

- 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.

  Detailed information on the proportions and characteristics of the MSW is included in this CDM PDD. The information was gathered through actual sampling and analysis over the period 2003-2005 of waste from the same sources as are to supply the Project activity.

- The project activity may include electricity generation and/or thermal energy generation from the biogas, syngas captured, RDF processed or fresh waste, respectively, from the anaerobic digester, the gasifier, RDF combustor and fresh waste combustor. The electricity can be exported to the grid and/or used internally at the project site.

The Project activity involves the generation of electricity and thermal energy using fresh waste combustors (special purpose boilers). The combustors will consume waste in the form of MSW. The electricity produced will be used to supply the site and the remainder will be exported to the local grid. The thermal energy will be exported to factories at a nearby industrial park.

- The residual waste from the incinerator does not contain more than 1% residual carbon.

According to the feasibility study, the residual waste from the incinerator will contain no more than 1% residual carbon. This will be monitored *ex post* to ensure that this is the case for the Project activity when in operation.

- 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.

According to the a report on the current treatment of MSW in China[2], as of the end of 2005 less than 3% of landfill sites comply with the regulation for methane capture and utilization[3]. This will be monitored every year and should the compliance rate rise to 50% or greater, the project will no longer be able to claim CERs for methane avoidance.

The Project activity involves the incineration of municipal solid waste originally intended for landfill. By diverting the MSW from disposal at a landfill, the methane emissions that would have been caused by the anaerobic breakdown of the MSW in the landfill will be avoided. Furthermore, combusting the waste to produce electricity to meet the needs of the site and for export to the local grid, and the sale of thermal energy to a nearby industrial site to replace thermal energy previously supplied by coal boilers, will replace energy production by more fossil fuel-intensive methods, leading to additional emission reductions.

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

The spatial extent of the Project boundary is shown in the figure below, and includes: the site of the Project activity where the waste is to be treated, including the facilities for processing the waste, on-site electricity generation and consumption, onsite fuel use, thermal energy generation and the wastewater treatment facility; the landfill site; the boilers at the nearby industrial park that supply the thermal energy that is to be displaced in the Project activity; and the electricity generation plants connected to the North China Grid.

[2] The Report for Chinese MSW Treatment and Fees Charging Status (January 26, 2007) http://www.ndrc.gov.cn/zjgx/t20070126_113825.htm

[3] Landfill Technology Codes for MSW, enforced on January 15, 1999, Chinese regulation reference no. CJJ17-88

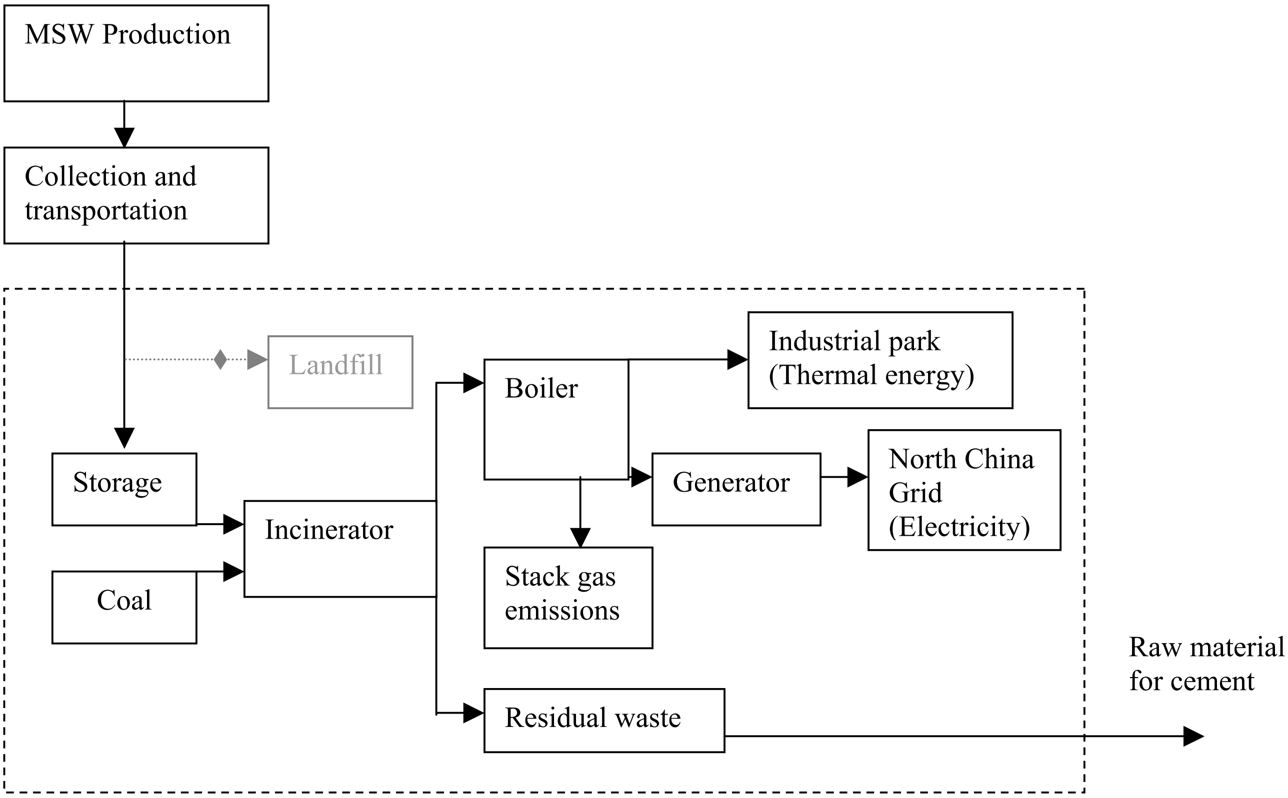

Figure 2: Project boundary

Emission sources and gases included in or excluded from the Project boundary are listed in the following table:

Emissions sources included in or excluded from the Project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	Emissions from electricity consumption	CO_2	Included	Electricity is provided to the site mainly by coal-fired power stations on the North China Grid. The Project activity will generate enough electricity to export to the grid.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Emissions from decomposition of waste at the landfill site	CO_2	Excluded	CO_2 emissions from the decomposition of organic waste are not counted.
		CH_4	Included	Main source of emissions in the baseline.

		N_2O	Excluded	Excluded for simplification. This is conservative.
	Emissions from thermal energy generation	CO_2	Included	Displaces thermal energy generation by customers nearby who use coal-fired boilers.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project activity	Emissions from on-site electricity use	CO_2	Included	All electricity to be used by the Project activity is expected to be supplied by the Project's generators. CO_2 emissions from the on-site generation are calculated in 'Direct emissions from the waste treatment process'; however, if any electricity is drawn from the grid, the amount will be recorded to calculate the corresponding emissions.
		CH_4	Excluded	Amount is negligible so excluded for reasons of simplification.
		N_2O	Excluded	Amount is negligible so excluded for reasons of simplification.
	On-site fossil fuel consumption due to the Project activity other than for electricity generation	CO_2	Included	May be an important emission source.
		CH_4	Excluded	Amount is negligible so excluded for reasons of simplification.
		N_2O	Excluded	Amount is negligible so excluded for reasons of simplification.
	Direct emissions from the waste treatment process	CO_2	Included	CO_2 emissions from the combustion process shall be included.
		CH_4	Included	In the experience of the project owner, the temperatures involved in the combustion process are high enough to ensure all CH_4 is combusted; however, it will be monitored to ensure this is the case.
		N_2O	Included	A small amount of N_2O is produced from fresh waste combustion.

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

The following credible alternatives are analyzed:
For MSW management, the alternatives considered are as follows:

M1 The project activity (i.e. 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 electricity generation, the alternatives considered are as follows:

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 captive power 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.

For heat generation, the alternatives considered are as follows:

H1 Heat generated from by-product of one of the options of waste treatment as listed in M1 above, not undertaken as a CDM project activity.
H2 Existing or Construction of a new on-site or off-site fossil fuel fired cogeneration plant.
H3 Existing or Construction of a new on-site or off-site renewable based cogeneration plant.
H4 Existing or new construction of on-site or off-site fossil fuel fired boilers.
H5 Existing or new construction of on-site or off-site renewable energy based boilers.
H6 Any other source such as district heat.
H7 Other heat generation technologies.

As described in further detail in section B.5 below, M1 is not a realistic scenario because an incineration plant would not be a viable option for a company in the region. The high initial costs coupled with low income, mean that such a project would have difficulty completing financial closure without significant public assistance. The fact that only around 3.72% of waste in China is disposed of by incineration[4] clearly supports this view.

In the case of M2, there is no alternative landfill in the region with methane capture and destruction facilities and the capacity to handle the extra waste. Given the costs associated with the installation and operation of landfill gas capture facilities, installation is not likely, While regulations remain un-enforced, the waste is likely to be disposed of at the Linyi Landfill Site and the capture and destruction of landfill gas is not likely to occur without CDM or some other subsidy program to provide an incentive. Therefore, the most likely scenario for the waste is M3: the continued disposal of MSW at Linyi Landfill Site for MSW Sanitation Treatment.

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[4] The current situation of solid waste management in China, Qifei Huang *et al.*, Journal of Material Cycles and Waste Management (2006)

In the case of P1, according to a review of waste-handling practice in China performed by Shanghai JEC Environmental Consultant Co., Ltd., at the end of 2003 there were 457 landfills serving the 660 major Chinese cities included in the review. Apart from simple safety control systems to prevent explosions, the overwhelming majority vent LFG directly into the atmosphere. The few that do utilize the LFG are all demonstration projects or receive additional funding from development organisations[5].

P2 would not be feasible as the construction and operation of a fossil fuel fired power plant below 135 MW in capacity is not permitted under current Chinese regulations. There is no alternative cogeneration plant in the area.

P3 would not be feasible because of the high investment costs and the relative lack of a suitable renewable energy source in the area.

P4 and P5 do not apply to this project as the MSW incineration plant is seeking to generate electricity primarily for sale to the local grid, rather than to meet existing energy requirements. In the absence of the project activity, P6 is the most likely scenario: the existing and new grid-connected power plants would supply electricity.

In the case of H1, financial closure would be difficult because the gas produced would need to be transported over 20km (to the region of the proposed incinerator) in order to reach industrial operations of a big enough scale to meet the supply. This would require a prohibitively large initial investment in pipelines and the installation of boilers able to burn the gas, as well as increased operation and maintenance costs. The IRR of such projects is not high enough to justify large-scale implementation on income from energy alone. Furthermore, financial closure would only be possible under exceptional circumstances.

H2 and H3 would not be possible as the thermal energy requirements of the companies to be supplied under the project activity are currently met by existing plant. Investment in a cogeneration or thermal energy plant by the companies would not be feasible given that they have existing equipment for the purpose and the high investment costs of a new purpose-built facility.

In the case of H4, the companies to be supplied by the project activity already have fossil fuel fired boilers installed, therefore, the continued use of these boilers is the most likely scenario in the absence of the project activity given there are no regulations prohibiting their use.

In the case of H5, there is no local supply of a renewable energy resource that could be used in place of the anthracite without incurring prohibitive costs or supply risks, because the investment required to adapt the existing boilers to use a renewable resource would not be economical without an additional income stream such as that obtained through CDM.

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[5] Environmental and Health Challenges of Municipal Solid Waste in China, SL Jones, China Environment Forum (2007)
http://www.wilsoncenter.org/INDEX.CFM?TOPIC_ID=1421&FUSEACTION=TOPICS.ITEM&NEWS_ID=218565

In the case of H6 and H7, no other alternative thermal energy source is available, and alternative heat generation technologies such as heat pumps or solar energy would either not be economical to install given that boilers are already in place, or they would not supply sufficient heat to meet requirements.

Therefore, the most realistic and credible baseline scenario is H4, “disposal of waste at a landfill without the capture of landfill gas”.

The Project activity requires supplementary income from the CDM in order to be financially viable. The project participant proceeded with the implementation of this Project with the expectation that it would be registered as a CDM project activity and issued with CERs in the future.

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):

Construction of the plant began in July 2006. The feasibility study was completed in 2002, and clearly referred to the advice from the Chinese government regarding the contribution that the CDM could make to various comprehensive resource-utilization projects, such as MSW combustion for heat and power generation. Between the completion of the feasibility study and the initiation of construction, the Project costs significantly increased, consequently, CDM revenue progressively became a more significant source of income for the Project.

Prohibitive barriers that the Project activity faces are clearly identified using the “tool for the demonstration and assessment of additionality”. 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 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

The Project developer had the following alternatives to the Project activity:

- The proposed project activity not undertaken as a CDM project
- Continuation of current practice (no project activity or other alternative undertaken)
- Landfill gas collection / destruction project (with or without energy generation)

Sub-step 1b. Enforcement of applicable laws and regulations

All scenarios except for the continuation of current practice are in compliance with applicable laws and regulations; however, in the case of the continuation of current practice, compliance with current regulations in China is below 50%. The compliance rate will be monitored and should it rise to 50% or greater, the project will no longer be able to claim CERs for methane avoidance. As described in the previous sections, the implementation of an LFG recovery project would not have been feasible due to financial/investment barriers. The procurement of capital from investors would have been extremely difficult in the absence of income supplementary to that received through energy sales. Even if the developer could have procured the required capital, expected returns were unlikely to surpass the company's benchmark and the capital would have been invested elsewhere.

Therefore, the only plausible alternatives available to the Project developer were:

- The proposed Project activity not undertaken as a CDM project
- Continuation of current practice (no Project activity or other alternative undertaken)

Step 2 - Investment Analysis

Sub-step 2a. Determine appropriate analysis method

In order to determine whether the proposed Project is financially attractive without revenue from the sale of CERs, Option III – "Apply benchmark analysis", is completed below. As suggested in the tool for the demonstration and assessment of additionality, Project IRR will be used in the investment analysis.

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

IRR is deemed the most suitable financial indicator for the Project and, using option (c) of this sub-step in the additionality tool, is compared to the China National Environmental Protection Corporation IRR benchmark of 15% for all industrial projects in which it holds a majority stake. Because CECIC owns a 60% stake in Linyi National Environmental New Energy Co., Ltd, the project IRR, at 7.19%, is too low to justify the allocation of funds to the Project without some form of additional revenue.

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

Due to high initial costs associated with the planning, engineering, and construction of the Project, it does not represent an attractive investment opportunity in the absence of additional revenue from the sale of CERs. As can be seen from the financial data displayed below, the Project IRR is not high enough to justify investment, considering the risks involved. With the CER revenue incorporated into the IRR calculation, the additional, relatively reliable revenue stream provides enough of an incentive for the Project developer to proceed.

Item	Assumptions/Sources	Value
Financial Details		
Costs		
Initial capital cost	Supplied by Project developer based on quotes and current prices (equipment and plant cost 146,120,000 Yuan)	278,000,000 Yuan
Fuel cost/year (coal)	Average local price, 480 Yuan/ton.	35,040,000 Yuan/year
O&M cost/yr	Estimated as 3% of the cost of the initial capital cost (278,000,000 Yuan)	8,340,000 Yuan/yr

Revenues		
Electricity tariff	Average local price (including tax)	0.45 Yuan/kWh
Electricity sales	Assuming the generator is in operation 330 days in a year, a load factor of 85%, and that 22% of the electricity is used on-site (131,274 MWh/year)	50,487,980 Yuan/year
Thermal energy tariff	Average local price	22.1 Yuan/GJ
Thermal energy sales	Assuming capacity factor of 912,000 GJ/y and zero parasitic use by the plant.	20,155,200 Yuan/year
Other income		
Waste disposal fee	MSW disposal fee (at 30 Yuan/ton), for 292,000 t/yr	8.76 million Yuan/year
Raw material sales	Supplied by Project developer based on current price of 15 Yuan/ton and production of 55,000 tons/year	825,000 Yuan/year
Project life	Minimum projected life	22 years
Project IRR for operations		7.19%

The Project's IRR is estimated to be 7.19%, which is much lower than the Project's benchmark of 15%. The low IRR, compared to the hurdle rate, indicates that the Project is not financially attractive without an additional revenue stream, such as that obtained through the CDM. The relatively low return does not justify the risks associated with implementing this new waste-incineration power project.

Sub-step 2d –Sensitivity Analysis

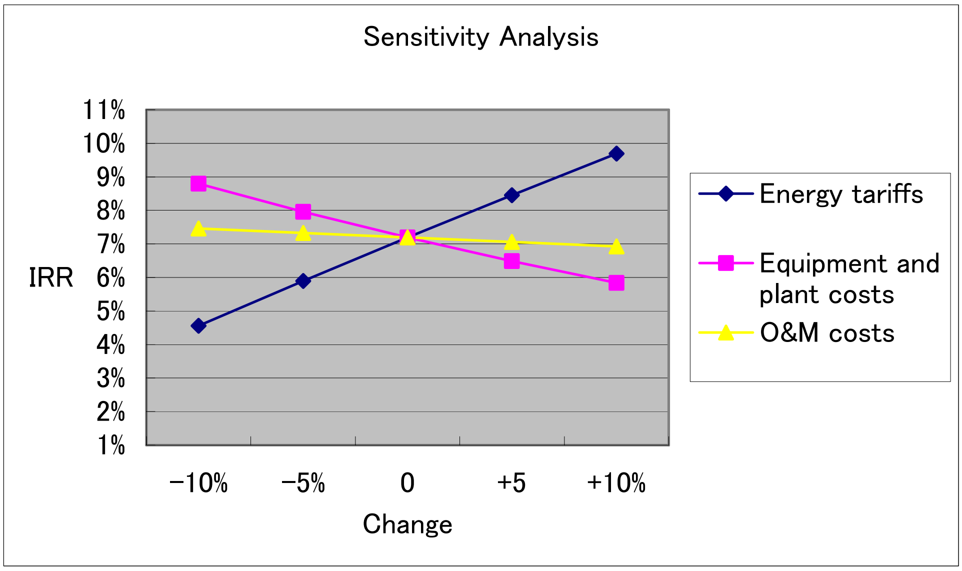
The following sensitivity analysis is performed to confirm the conclusion regarding the financial attractiveness of the Project is robust:

1) The average tariff for electricity and thermal energy will be 10% higher than expected. (Project IRR = 9.69%)
2) The costs for equipment and plant will be 10% lower than expected. (Project IRR = 8.79%)
3) O&M costs will be 10% lower than expected. (Project IRR = 7.46%)
4) The Project life will be 5 years longer than expected (Project IRR = 8.20%)

The following table and diagram give the results of the sensitivity analysis for each scenario.

Summary of SA

Changes	−10%	−5%	0	+5	+10%
Energy tariffs	4.56%	5.90%	7.19%	8.45%	9.69%
Equipment and plant costs	8.79%	7.96%	7.19%	6.49%	5.84%
O&M costs	7.46%	7.33%	7.19%	7.06%	6.92%



The Project equity did not surpass the benchmark even after applying 4 different favourable conditions to the financial analysis. The sensitivity analysis confirms the fact that the Project is unlikely to be financially attractive and successful implementation is dependent upon CDM assistance.

STEP 4 – Common Practice Analysis

Sub-step 4a – Analyse other activities similar to the proposed project activity

Projects in which fresh waste is combusted to produce energy are still very rare in China. In fact, waste incineration (most of which does not involve energy generation projects) accounts for less than 3.72% of all MSW disposal. At present, there is no other incineration plant in the vicinity of Linyi City.

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

Very few similar activities are being carried out by enterprises in China at present. Private project developers are reluctant to invest in this untested technology because in their view the high risks do not justify the low returns.

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.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline emissions due to grid electricity displacement are determined by multiplying the net electricity exported to the grid by the Project by the CO_2 emission factor (CEF) of the North China Power Grid. In accordance with AM0025, the grid CEF is calculated as directed in ACM0002, selecting the option to perform an *ex ante* calculation in order to set the CEF for each crediting period. The official *ex ante* CEF calculation, and results for both the Operating Margin (OM) and the Build Margin (BM) have been publicly released by the Chinese DNA (Office of Climate Change under the National Development and Reform Commission)[6]. Please see Annex 3 for the calculations.

Baseline emissions due to displacement of fossil fuel consumption in baseline boilers when thermal energy from the project is supplied to nearby users, is determined by multiplying the CO_2 emission factor (CEF) of anthracite (the users' current fuel of choice) by baseline fuel consumption.

Baseline emissions due to methane gas avoidance (through utilizing MSW instead of dumping it in landfill) is determined for the amount of waste consumed in the Project boilers, using the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site". Actual measured data is taken for the composition of the waste and the appropriate IPCC factors are selected. No CH_4 would have been destroyed at the landfill site in the absence of the Project ($MD_{reg,y} = 0$)

Project emissions are calculated for CO_2 emissions from combustion of fossil fuels in the Project activity. Furthermore, emissions from fossil based waste such as plastics and rubber are determined along with N_2O and CH_4 emissions from the stack.

Leakage is not determined for waste transportation because the distance to the Project site from the waste source, Linyi City, is 23km less than that to the landfill site. The other forms of leakage described in AM0025 do not apply to MSW incineration plants.

Final emission reductions (tCO_2e/yr) are determined by deducting project emissions from baseline emissions. Predicted emission reductions for each year of the crediting period are displayed in section A.4.4.

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

Data / Parameter:	**GWP_{CH4}**
Data unit:	tCO_2e/tCH_4
Description:	Global warming potential of CH_4
Source of data used:	IPCC
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.

[6] http://cdm.ccchina.gov.cn/web/index.asp

Any comment:	-

Data / Parameter:	**GWP_{N2O}**
Data unit:	tCO_2e/tN_2O
Description:	Global warming potential of N_2O
Source of data used:	IPCC
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:	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.
Any comment:	-

Data / Parameter:	**OX**
Data unit:	-
Description:	Oxidation factor
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied:	The landfills are not covered with oxidizing materials.
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
Value applied:	0.5

Justification of the choice of data or description of measurement methods and procedures actually applied:	-
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
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied:	-
Any comment:	-

Data / Parameter:	**MCF**
Data unit:	-
Description:	Methane correction factor
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied:	Value given for semi-aerobic managed solid waste disposal sites
Any comment:	-

Data / Parameter:	**DOC_j**
Data unit:	-
Description:	Fraction of degradable organic carbon (by weight) in waste type j
Source of data used:	Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site
Value applied:	See baseline data
Justification of the choice of data or description of measurement methods and procedures actually applied:	Values for dry waste chosen, based on the conditions in the region (see k_j below).
Any comment:	-

Data / Parameter:	k_j
Data unit:	-
Description:	Decay rate for waste type j
Source of data used:	Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site
Value applied:	See baseline data.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Mean Annual Temperature (MAT) = 13.2ºC (1958 – 2001) Mean Annual Precipitation (MAP) = 855.8mm (1992 – 2001) Potential Evotranspiration (PET) = 1359.74mm MAP/PET < 1 Based on this data, the climate is classed as: Boreal and Temperate, Dry
Any comment:	Values for dry waste chosen, based on the conditions in the region.

Data / Parameter:	CEF_d
Data unit:	tCO_2/MWh
Description:	Emission factor of baseline electricity for EG_d
Source of data used:	Chinese DNA
Value applied:	1.03 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied:	As explained in B.6.1., the official *ex ante* CEF calculation and results for both the OM and the BM of the North China Power Grid have been publicly released by the Chinese DNA. The OM of 1.12 tCO_2/MWh and a BM of 0.94 tCO_2/MWh. As recommended, the OM and BM are each weighted equally, giving a CM (CEF_d) of 1.03 tCO_2/MWh.
Any comment:	Based on the CM method as directed in ACM0002. To be updated at the start of each new crediting period.

B.6.3 Ex-ante calculation of emission reductions:

Baseline emissions

Baseline emissions are claimed for the following sources:

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

$BE_y = (MB_y – MD_{reg,y}) + EG_y * CEF_{baseline,elec,y} + EG_{d,y} *CEF_d + HG_y *CEF_{baseline,therm,y} + HG_{m,y} * CEF_m$

$BE_{,y}$ 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 (tCO_2e)

$MD_{reg,y}$ is methane that would be destroyed in the absence of the project activity in year y (tCO_2e)

EG_y	is the amount of electricity in the year y that would be consumed at the project site in the absence of the project activity and which is not consumed anymore due to the implementation of the project activity, (MWh).
$CEF_{baseline, elec,y}$	is the carbon emissions factor for electricity consumed at the project site in the absence of the project activity (tCO_2/MWh)
$EG_{d, y}$	is the amount of electricity generated utilizing the biogas/syngas collected, RDF Produced or the fresh waste and exported to the grid in the project activity during the year y (MWh)
CEF_d	is the carbon emissions factor for the displaced electricity source in the project scenario (TCO2/MWh)
HG_y	is the quantity of thermal energy that would be consumed in year y at the project site in the absence of the project activity and which is not consumed anymore due to the implementation of the project activity (MWh).
$CEF_{baseline, therm, y}$	is the CO_2 emissions intensity for thermal energy generation (tCO_2e/MJ)
$HG_{m, y}$	is the amount of thermal energy generated utilizing the biogas/syngas collected, RDF Produced or the fresh waste and exported to external customers during the year y (GJ)
CEF_m	is the carbon emissions factor for the displaced thermal energy source in the project scenario (tCO_2/GJ)

This is completed for year 1 below:

By_e = (605 – 0) 21 + 0 + (131,274 * 1.03) + 0 + ([912,000 /0.783]*0.0983)

= 262,412 tCO_2e/yr

Emissions from decomposition of waste at the landfill site

As directed in AM0025, the 'Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site' is used to estimate the amount of avoided CH_4 emission from MSW disposal.

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

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, $A_{j,x}$, was estimated from historical data obtained from measurements of the composition of the waste.

Linyi City has an average annual temperature of 16°C and average annual rainfall of 855.8mm. There are no landfill sites in the area that collect landfill gas (LFG) for flaring/energy generation and there are no regulations requiring this.

Data and defaults used for MSW						
Φ	F	DOC_j	k_j	DOC_f	MCF	$A_{j,x}$
0.9	0.5	See below	See below	0.5	0.5	292,000

MSW type	Portion (%)	DOC_j (% content)	k_j
Wood and wood product	1.17	50	0.02
Pulp, paper and cardboard	2.58	44	0.04
Food, food waste, beverage and tobacco	59.00	38	0.06
Textiles	1.63	30	0.04
Garden, yard and park waste	0.00	49	0.05
Glass, plastic metal, other inert waste	35.62	0	0
Total	100.00		

Note: The percentages are the arithmetic means of actual measurements of MSW for the years 2003-2005.

OX is equal to 0 since no oxidizing material is used to cover the baseline landfill.
Baseline emission reductions from the decay of MSW are presented below:

	Baseline emissions from decay (tCO_2/yr)
2008	12,705
2009	24,675
2010	35,973
2011	46,620
2012	56,679
2013	66,150
2014	75,075

Note: When for any particular year it can not be demonstrated that the waste would have been disposed of in the landfill, the waste quantities prevented from disposal should be assigned a value of 0 in the calculations using the tool.

Emissions from displaced grid electricity

As explained in B.6.1., the official *ex ante* CEF calculation and results for both the OM and the BM of the North China Power Grid have been publicly released by the Chinese DNA (see Annex 3 for tables). The OM is 1.12 tCO_2/MWh and the BM is 0.94 tCO_2/MWh, giving a CM (CEF_d) of 1.03 tCO_2/MWh. Assuming the 25MW generator is running for 330 days in a year, with a load factor of 85%, the total amount of electricity produced will be 168,300 MWh/yr. This PDD assumes that 22% of the generated electricity is used on site, therefore, the total amount of electricity available to be exported to the grid ($EG_{d,y}$) will be approximately 135,212 MWh/yr. The emissions associated with this amount of grid-generated electricity are calculated as follows:

$$BE_{elec} = EG_y . CEF_d$$

$$= 131{,}274 \times 1.03 \qquad = 135{,}212 \text{ tCO}_2\text{/year}$$

Emissions from displaced thermal energy

Baseline emissions due to displacement of fossil fuel consumption in baseline boilers is determined by multiplying the CEF of baseline boilers (CEF_m = carbon emission factor of anthracite 0.098 (tCO_2/GJ) by the estimated amount of thermal energy to be exported to customers by the Project activity ($HG_{m,y}$ = 912,000 GJ/yr).
The Project activity will replace the thermal energy supply from over 100 nearby coal-based boilers. In a study of coal-fired industrial boilers in operation in China[7], the efficiency of the boilers, according to the specifications provided by the manufacturer, is within the range 72-80%; however, the actual obtained efficiency is within the range 60-65%. The Project Developer performed a survey of the boilers within the Project boundary and, using the manufacturers' specifications as a conservative estimate, established a mean efficiency of 78.3%. This can be seen as a highly conservative estimate, as it not only uses manufacturers' design specifications rather than actual performance (which, as found in the study above is usually significantly lower than design specification), but the figure found for manufacturers' specification is at the higher end of the range found by the official survey mentioned above. $BE_{thermal}$ is calculated as follows:

$$BE_{thermal,y} = \frac{Q_y}{\in_{boiler}} \cdot CEF_m$$

$$= \frac{912{,}000}{0.783} \cdot 0.0983 \qquad = 114{,}495 \; tCO_2/year$$

<u>Project emissions</u>

Project emissions are determined for the following sources:

- Emissions from fuel use on-site
- Emissions from combustion of fresh waste

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

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 in year y (tCO_2e)
$PE_{a,y}$	is the emissions from the anaerobic digestion process 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 waste water treatment in year y (tCO_2e)

$= 0 + 191{,}587 + 0 + 48{,}608 + 0 = 240{,}195 \; tCO_2e/yr$

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[7] Resource Conservation and Environmental Protection Department of National Development and Reform Commission *"Implementation Guide to 10-Key Energy Conservation Programs"*, Page 7, China Development Press, February 2007.

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

As the Project will be a net exporter of electricity, emissions resulting from grid-generated electricity are treated as 0 in this PDD. There may be times, however, when grid-generated electricity is used. To ensure all associated emissions are included, the amount of electricity drawn from the grid will be recorded continuously with an electricity meter.

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

The project is expected to consume approximately 73,000 t/yr of coal (anthracite) as a supplementary fuel.

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

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

= 73 kt/yr * 26.7 TJ/kt * 98.3 tCO_2/TJ = 191,587 tCO_2/yr

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

GHG emissions are determined from fossil-based waste within the MSW as well as from the boiler stacks:

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

$PE_{i,f,y}$	is the fossil-based waste CO2 emissions from MSW combustion in year y (tCO_2e)
$PE_{i,s,y}$	is the N_2O and CH_4 emissions from the final stacks from MSW combustion in year y (tCO_2e)

= 48,608 tCO_2e/yr + 0 = 48,608 tCO_2e/yr

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

$$P_{i,f,y} = \sum_i A_i \cdot CCW_i \cdot FCF_i \cdot EF_i \cdot \frac{44}{12}$$

$P_{i,f,y}$	is the fossil-based waste CO_2 emissions from fresh waste combustion in year y (tCO_2e)
A_i	is the amount of waste type i fed (t/yr)
CCW_i	is the fraction of carbon content in waste type i (fraction)
FCF_i	is the fraction of fossil carbon in waste type i (fraction)
EF_i	is the combustion efficiency for waste type i (fraction)
44/12	is the conversion factor (tCO_2/tC)

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

Waste type	Amount (t/yr)	CCW	FCF	Combustion factor
Wood and wood products	3,416	0.5	0	0.99
Pulp, paper and cardboard	7,534	0.46	0.01	0.99
Food, food waste, beverage and tobacco	172,280	0.38	0	0.99
Textiles	4,769	0.5	0.2	0.99
Garden, yard and park waste	0	0.49	0	0.99
Plastic	14,396	0.75	1	0.99
Ash	80,787	0.03	1	0.99
Glass, metal and other inert waste	8,789	0	0	0.99

The emissions from fossil based waste are therefore calculated for four categories: pulp, paper and cardboard, textiles, plastic and ash, as follows:

$$= [(7534 \times 0.46 \times 0.01) + (4769 \times 0.5 \times 0.2) + (14396 \times 0.75 \times 1) + (80787 \times 0.03 \times 1)] \cdot 0.99 \cdot \frac{44}{12}$$

$= \; 48{,}608$ tCO2e/yr

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

$PE_{i,s,y} = SG_{i,y} * MC_{N2O,i,y} * GWP_{N2O} + SG_{i,y} * MC_{CH4i,y} * GWP_{CH4}$

$PE_{i,s,y}$ is the total emissions of N_2O and CH_4 from MSW combustion in year y (tCO_2e)
$SG_{i,y}$ is the total volume of stack gas from MSW combustion in year y (m^3/yr), based on a capacity rate of 140,000 m^3/hour, 330 days/year, and a load factor of 0.85.
$MC_{N2O,i,y}$ is the monitored content of nitrous oxide in the stack gas from waste incineration in year y (tN_2O/m^3)
GWP_{N2O} is the global warming potential of nitrous oxide (tCO_2e/tN_2O)
$MC_{CH4i,y}$ is the monitored content of methane in the stack gas from waste incineration in year y (tCH_4/m^3)
GWP_{CH4} is the Global Warming Potential of methane (tCO_2e /tCH_4)

$PE_{i,s,y}$ = 942.48E6 m^3/year * 0 * 310 + 942.48E6 m^3/year * 0 * 21

= 0 tCO_2e/year

The temperature within the incinerator will, in the experience of the project developer, be high enough to ensure all the methane is combusted and all the N_2O breaks down. Although the amounts of these gases are set at 0 for this version of the PDD, the CH_4 and N_2O content will be monitored to determine GHG emissions *ex post*.

Emissions from waste water treatment in the year y ($PE_{w,y}$)

Wastewater will not be treated anaerobically, but will be treated using a chemical treatment method.

Emissions from this source are therefore assumed to be zero.

Leakage

In AM0025, leakage is determined for the following:

- Emissions from increased transportation
- Emissions from the residual waste from the anaerobic digester, the gasifier, the processing/combustion of RDF/stabilized biomass
- Emissions from end use of stabilized biomass.

As this is an MSW incineration project, the only relevant leakage is for increased transportation. Leakage in the year y (L_y) is therefore calculated as follows:

$L_y = L_{t,y}$

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

Leakage emissions from increased transport in year y (tCO_2e)

The distance from the fresh waste source, the city of Linyi, to the Project site is 23km less than that from the source to the landfill. Given that waste would need to be transported the extra 23km in the absence of the project activity, it is conservative to assume that there are zero additional emissions from transport in the Project scenario. If further leakage is found to occur, the following equation will be to be used to determine the corresponding amount of emissions:

Leakage emissions from transport ($L_{t,y}$)

$$L_{t,y} = \sum_{i}^{n} NO_{vehicles,i,y} \cdot DT_{i,y} \cdot VF_{cons,i} \cdot CV_{fuel} \cdot D_{fuel} \cdot EF_{fuel}$$

$NO_{vehicles,i,y}$ is the number of vehicles for transport with similar loading capacity
$DT_{i,y}$ is the average additional distance travelled by vehicle type i compared to baseline in year y
$VF_{cons,i}$ is the vehicle fuel consumption in litres per kilometre for vehicle type i (l/km)
CV_{fuel} is the Calorific value of the fuel (MJ/Kg or other unit)
D_{fuel} is the fuel density (kg/l), if necessary
EF_{fuel} is the Emission factor of the fuel (tCO_2/MJ)

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

Year	Estimation of baseline emissions (tCO_2e)	Estimation of project emissions (tCO_2e)	Estimation of leakage	Estimation of emission reductions

			(tCO_2e)	(tCO_2e)
2008	262,412	240,205	0	22,204
2009	274,382	240,205	0	34,182
2010	285,680	240,205	0	45,476
2011	296,327	240,205	0	56,128
2012	306,386	240,205	0	66,172
2013	315,857	240,205	0	75,645
2014	324,782	240,205	0	84,579
TOTAL	2,065,826	1,681,435	0	384,391

Average annual emission reductions are 54,913 tCO_2e.

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**F_{cons}**
Data unit:	Mass or volume unit per year
Description:	Quantity of fossil waste type *i* combusted in the Project activity during year y
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	73,000 t/yr of coal
Description of measurement methods and procedures to be applied:	Monitored continuously
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:	**NCV_{fuel}**
Data unit:	GJ/mass or volume unit
Description:	NCV of the fossil fuel
Source of data to be used:	Official data for coal
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Anthracite: 26.7 TJ/kt

Description of measurement methods and procedures to be applied:	Review the appropriateness of the data annually
QA/QC procedures to be applied:	Country-specific data is applied, resulting in no error due to measurement.
Any comment:	-

Data / Parameter:	**EF_{fuel}**
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor for fossil fuel
Source of data to be used:	IPCC default used since more localised data is not available.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Anthracite: 98.3 tCO_2/TJ
Description of measurement methods and procedures to be applied:	Review the appropriateness of the data annually
QA/QC procedures to be applied:	IPCC default factor or country specific data may be applied, resulting in no error due to measurement.
Any comment:	-

Data / Parameter:	**$MC_{N2Oi,y}$, $MC_{CH4i,y}$**
Data unit:	$tN_2O/m3$, tCH_4/m^3
Description:	Fraction of N_2O and CH_4 in stack gas
Source of data to be used:	Project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	$CH_4 = 0$ $N_2O = 0$ mg/m^3
Description of measurement methods and procedures to be applied:	Samples to be taken at least quarterly.
QA/QC procedures to be applied:	Maintenance and calibration of equipment will be carried out according to internationally recognised procedures. Where laboratory work is outsourced, one which follows rigorous standards shall be selected.
Any comment:	The temperature in the boiler is expected to such that all the CH_4 will be combusted and all of the N_2O will decompose. Although this is assumed to be zero for this version of the PDD, it will be monitored and determined *ex post*

Data / Parameter:	**SG_y**
Data unit:	m^3/yr
Description:	Stack gas volume flow rate
Source of data to be used:	Project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	942.48E6
Description of measurement methods and procedures to be applied:	Samples to be taken at least quarterly. The stack gas volume flow rate will be estimated by summing the inlet biogas and air flow rates and adjusting for stack temperature. Air inlet flow rate should be estimated by direct measurements using flow meter. Where there are multiple stacks of the same type, it is sufficient to monitor one stack of each type.
QA/QC procedures to be applied:	Maintenance and calibration of equipment will be carried out according to internationally recognised procedures. Where laboratory work is outsourced, a laboratory which follows rigorous standards shall be selected.
Any comment:	Although this is assumed to be zero for this version of the PDD, it will be monitored and determined *ex post*

Data / Parameter:	**A_i**
Data unit:	t/yr
Description:	Amount of waste type i
Source of data to be used:	Project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Assuming 292,000 tonnes of MSW is burnt per year: (see table below)
Description of measurement methods and procedures to be applied:	Data to be aggregated annually.
QA/QC procedures to be applied:	Regular sorting & weighing of waste (initially quarterly) by project proponent will be carried out. Procedures will be checked regularly by a certified institute/ DOE.

MSW type	Portion (%)	tonnes/yr
Wood and wood product	1.17	3416.4
Pulp, paper and cardboard	2.58	7533.6
Food, food waste, beverage and tobacco	59.00	172280
Textiles	1.63	4759.6
Garden, yard and park waste	0.00	0
Plastic metal, other inert waste	4.93	14396
Ash	27.67	80787
Glass, metal and other inert waste	3.01	8789

Any comment:	

Data / Parameter:	CCW_i
Data unit:	fraction
Description:	Fraction of carbon content in waste type i
Source of data to be used:	IPCC default or other reference data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see project emission calculations
Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	From IPCC guidelines. QA/QC procedures not applicable.
Any comment:	-

Data / Parameter:	FCF_i
Data unit:	fraction
Description:	Fraction of fossil carbon in waste type i
Source of data to be used:	IPCC default or other reference data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Please see project emission calculations
Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	From IPCC guidelines. QA/QC procedures not applicable.
Any comment:	This is a conservative assumption.

Data / Parameter:	EF_i
Data unit:	fraction
Description:	Combustion efficiency for waste type i
Source of data to be used:	IPCC
Value of data applied for the purpose of calculating expected	0.99 for all waste types

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	From IPCC guidelines. QA/QC procedures not applicable.
Any comment:	This is a conservative assumption.

Data / Parameter:	**f**
Data unit:	fraction
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
Source of data to be used:	Written information from the operator of the solid waste disposal site and/or site visits at the solid waste disposal 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:	To be carried out annually
QA/QC procedures to be applied:	Data to be made available to DOE at verification.
Any comment:	-

Data / Parameter:	$\mathbf{W}_x$
Data unit:	t/yr
Description:	Total amount of fresh waste prevented from landfill disposal in year x
Source of data to be used:	Measurements by project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	292,000 tonnes
Description of measurement methods and procedures to be applied:	Monitored continuously and aggregated annually
QA/QC procedures to be applied:	Weighbridge will be subject to periodical calibration in accordance with the manufacturer's guidelines. Receipts showing the income from the handling of MSW will be provided to the DOE to double check.
Any comment:	-

Data / Parameter:	$\mathbf{P}_{n,j,x}$
Data unit:	-
Description:	Weight fraction of the waste type *j* in the sample *n* collected during the year *x*
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	Listed in section B.6.3
Description of measurement methods and procedures to be applied:	Sample the waste prevented from landfill disposal, using the waste category *j*, as provided in the table for DOC*j* and k*j*, and weigh each waste fraction. 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:	Regular sorting and weighing of waste at least quarterly. Procedures will be reviewed by the DOE.
Any comment:	-

Data / Parameter:	**z**
Data unit:	-
Description:	Number of samples collected during the year *x*
Source of data to be used:	Project participant
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:	
QA/QC procedures to be applied:	Implemented by the project participant, validated by the DOE.
Any comment:	-

Data / Parameter:	$\mathbf{EG_d}$
Data unit:	MWh/yr
Description:	Electricity generation of project using fresh waste
Source of data to be used:	Electricity meter
Value of data applied for the purpose of calculating expected emission reductions in	131,274 MWh/yr

section B.5	
Description of measurement methods and procedures to be applied:	Exported electricity continuously measured via a meter. This PDD was prepared assuming 22% of electricity is used on site. Gross electricity output and the electricity consumed on-site will also be monitored to provide an alternative means of verifying the exported amount.
QA/QC procedures to be applied:	Maintenance and calibration of equipment will be carried out according to internationally recognised procedures. Third parties will be able to verify.
Any comment:	Electricity generated from the use of fresh waste and exported to the grid

Data / Parameter:	**$HG_{m,y}$**
Data unit:	GJ/yr
Description:	Quantity of thermal energy produced by the project using fresh waste
Source of data to be used:	Device measuring quantity and temperature of steam
Value of data applied for the purpose of calculating expected emission reductions in section B.5	912,000 GJ/yr
Description of measurement methods and procedures to be applied:	Based on the properties of steam / water supplied and recorded annually
QA/QC procedures to be applied:	Maintenance and calibration of equipment will be carried out according to internationally recognised procedures. Third parties will be able to verify.
Any comment:	Thermal energy generated from the use of fresh waste and exported to customers. An estimated 300,000 tonnes of steam at 0.981Mpa and 296ºC will be supplied annually.

Data / Parameter:	**CEF_m**
Data unit:	tCO_2/GJ
Description:	Emission factor of baseline thermal energy for $HG_{m,y}$
Source of data to be used:	Calculated based on IPCC default for anthracite EF and assuming efficiency of existing boilers is 80%.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Anthracite: 98,300 kg CO_2e/TJ
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	The amount of thermal energy exported will be constantly monitored. Third parties will be able to verify.
Any comment:	This shall be updated yearly.

Data / Parameter:	**$NO_{vehicles}$**
Data unit:	-
Description:	Vehicles per carrying capacity per year
Source of data to be used:	Project participants
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:	Counter should accumulate the number of trucks per carrying capacity, annually
QA/QC procedures to be applied:	Implemented by the project proponent. Data to be made available to DOE at verification.
Any comment:	-

Data / Parameter:	**DT_v**
Data unit:	km
Description:	Additional distance travelled
Source of data to be used:	Expert estimate
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:	Recorded annually
QA/QC procedures to be applied:	Implemented by the project proponent. Data to be made available to DOE at verification.
Any comment:	-

Data / Parameter:	**VF_{cons}**
Data unit:	Litres
Description:	Vehicle fuel consumption in litres per km for vehicle type i
Source of data to be used:	Fuel consumption record
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of	Recorded annually

measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	Implemented by the project proponent. Data to be made available to DOE at verification.
Any comment:	-

Data / Parameter:	**$RATE^{compliance}_{y}$**
Data unit:	Number
Description:	Rate of compliance
Source of data to be used:	Municipal bodies and local common practice
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. This value should be monitored annually.
QA/QC procedures to be applied:	Data are derived from or based on those from municipal bodies, so QA/QC procedures for these data are not applicable.
Any comment:	-

Data / Parameter:	**$Carbon_{res\_was,y}$**
Data unit:	%
Description:	Amount of carbon in the residual waste from the incinerator
Source of data to be used:	Project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Less than 1%
Description of measurement methods and procedures to be applied:	Laboratory analysis, initially quarterly. Data to be aggregated annually.
QA/QC procedures to be applied:	Procedures will be checked regularly by a certified institute/ DOE.
Any comment:	

B.7.2 Description of the monitoring plan:

Purpose

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

Monitoring framework

Figure 3 below outlines the operational and management structure that CECIC will implement to monitor emission reductions and any leakage effects generated by the Project activity. CECIC will form an operational and management team, which will be responsible for monitoring of all the aforementioned monitoring parameters. This team will compose of a general manager and a group of operators. The group of operators, under the supervision of the general manager, will be assigned for monitoring of different parameters on a timely basis and will perform the recording and archiving of data in an orderly manner. Monitoring reports will be forwarded to and reviewed by the general manager on a monthly basis in order to ensure the Project follows the requirements of the monitoring plan.

The performance of the Project will be reviewed and analyzed by the consultants on a regular basis.

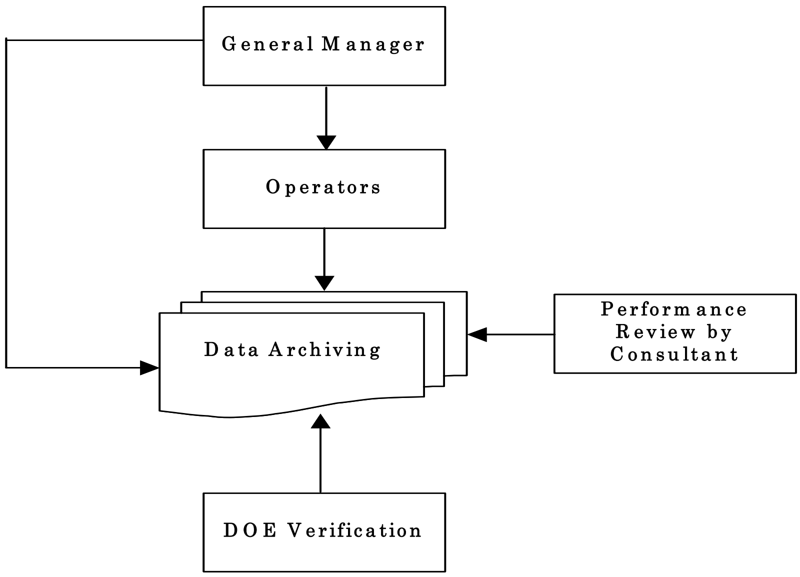

Figure 3. Operational and management structure for monitoring the Project activity.

Monitoring equipment and installation

The Project activity requires the monitoring of the following items:

- Electricity generation by the Project activity (the total amount, the amount used by the project activity, and the amount exported to the grid);
- Thermal generation from the Project activity (the amount exported to customers)
- The amount of waste consumed by the Project;
- The NCV of the waste;
- Waste fraction of the different waste types;

- Data on the relative amounts of MSW and coal combusted in the incinerator;
- Data needed to calculate CO_2 emissions from combustion of fossil-based waste;
- Data needed to calculate CO_2 emissions from the transportation of waste to the Project plant;
- Data needed to calculate CO_2 emissions from on-site consumption of fossil fuels;
- Data needed to calculate CH_4 and N_2O emissions from the boiler stacks;
- Data on analysis of residue left over from the combustion process;
- Rate of compliance by landfills in China with the national regulations regarding methane capture.

The monitoring methodologies for each are stated in the respective sections of B.7.2.

Data collection

This monitoring plan includes MSW composition analysis, MSW properties analysis, and measuring of the quantity of MSW, electricity, and fuel consumption. Additionally, monitoring of laws and regulations, as well as compliance are included in this monitoring plan. The data to be collected is listed below:

(1) The MSW composition analysis, waste type by weight, and analysis of MSW properties.
(2) Electricity consumption, import and export will be recorded continuously and aggregated monthly. The time and date each monitoring period starts and ends will be recorded.
(3) The project proponent will keep all relevant receipts for electricity sales and receipts for the income from MSW handling, as well as all relevant receipts for the purchase of electricity and fuel. These receipts (or photocopies) will be made available to the auditor at verification.
(4) Annual fossil fuel consumption will be monitored from the fuel purchase invoices.
(5) The administration department will monitor MSW treatment laws, regulatory information and compliance statistics, as well as national and international publications (such as the IPCC guidelines). Administration will submit an annual report on the above to the general manager.

Calibration

Regular calibration will be necessary for the monitoring equipment. 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 (at least once a year). A certificate of calibration will be provided for each piece of equipment after completion.

Data management

All data collected as part of monitoring plan should be archived electronically and be kept for at least 2 years after the end of the last crediting period.

Monitoring report

A monitoring report in line with CDM regulations and the requirements of this monitoring methodology will be issued annually by the general manager.

The monitoring report will contain a summary of the whole monitoring plan, and will describe the implementation of the monitoring plan in that particular year, present the relevant results and data, and calculate emission reductions for the period.

The report will include:

- Quality assurance reports for the monitoring equipment;
- Calibration reports for the monitoring equipment (including relevant standards and regulations);
- Any maintenance and repair of monitoring equipment;
- The qualifications of the persons responsible for the monitoring and calculations;
- The tests performed and data obtained;
- Emission reduction calculations;
- A summary of the monitoring plan in that particular year;
- Any other information relevant to the monitoring plan.

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

The baseline study was completed on 28/09/2007 by:

Clean Energy Finance Committee
Mitsubishi UFJ Securities (MUS)
26th Floor, Marunouchi Building,
2-4-1 Marunouchi, Chiyoda-ku
Tokyo, 100-6317, Japan

Tel: +81-3-6213-6302
Fax: +81-3-6213-6175
E-mail: joseph-cairnes@sc.mufg.jp

CECIC Blue-Sky Investment Consulting & Management Co., Ltd
Beijing Image, No.1 Building, Unit 2, 10th Floor
No.15 Fucheng Road
Haidian District
Beijing

Tel: (8610) 62268849
Fax: (8610) 62261552

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:

01/08/2007

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

22 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:

01/08/2007

C.2.1.2. Length of the first crediting period:

Seven (7) years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

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

An environmental impact report for the Project was completed in accordance with the relevant laws and regulations. The report has been approved by the Environment Protection Bureau of Shandong Province. The main requirements that the report placed on the Project are as follows:

1) The percentage of bituminous coal will not exceed 20% of the total fuel. An automatic monitoring device is included in the feeder to measure the relative amounts of MSW and bituminous coal. In addition, a device which separates alkali metals and discarded batteries will be installed.
2) The MSW storage pool will be non-permeable and a wastewater capture device will also be installed. Any leachate from the MSW will be combusted in the boiler.
3) The sulphur (S) content of bituminous coal is to be below 1.52% (0.46% of mixed fuels), desulphurization of the waste gases will result in the removal of at least 90% of the sulphur, and an additional filtration process will remove at least 99.8% of the dust from the waste gases. Stack gas emissions will meet *MSW Combustion Emission Standard* GB18484-2001, and stench emissions will meet *Stench Emission Standard* GB 14554-93. The chimney will be at least 120 m tall.
4) The wastewater will be separated into two waste streams: sanitary wastewater and industrial wastewater. The wastewater shall be recycled as much as possible, and any that is released will have been treated to meet the highest level of *Integrated Wastewater Emission Standard* GB8978-1996.
5) Anti-noise measures will be taken to ensure that the noise at the plant boundary meets the second level of *Industrial Enterprise Boundary Noise Standard* GB12348-90; the noise during project construction shall meet *Construction Boundary Noise Limitation* GB12523-90.
6) Residual waste from the incinerator will be sold as a replacement for clinker in cement manufacture. Any waste that is not utilized will be treated as hazardous waste.
7) A stack gas emission monitoring device will be installed according to national requirements, as stated in *Technical Guideline of Stack Gas Emission Monitoring in Coal/Oil-Fired Power Plant*.

The Project will meet all of the above requirements, and in response to a requirement of GB 18485-2001, the content of the waste will be monitored and a report submitted periodically to the local Environmental Protection Department.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The Project activity will reduce greenhouse gas emissions by approximately 55,000 tonnes CO_2e annually, when compared with the baseline scenario of coal-based generation and environmentally harsh methods of waste disposal. Additionally, the Project activity will significantly reduce harmful emissions (including SO_2, NOx and particulate matter) and lead to less tangible benefits for the local community such as improvements in the area's scenery and the reduction of noxious smells from the waste.

SECTION E. Stakeholders' comments

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

Survey questionnaires on the implementation of the Project were sent to the local residents, and the results compiled and reviewed by the project developer. A stakeholder consultancy meeting was organised, with announcements made in a local daily newspaper (Linyi Daily), on the internet at the site below and through posters placed at key transportation points and in nearby residential areas. A total of 37 people attended the stakeholders' meeting.

www.cecic-consulting.com.cn

E.2. Summary of the comments received:

Support for the Project was given from the local deputy mayor, on the grounds that it will bring an efficient method of dealing with increasing levels of waste being produced by the rapidly developing city of Linyi. Waste that would otherwise be disposed of at landfill, producing methane and polluting the local environment in the process. In addition to this, Linyi's wood-processing industry, the fourth largest in China, requires a large amount of heat to be supplied through small, inefficient boilers. Large efficiency gains and CO_2 emission reductions can be achieved by replacing the thermal energy supplied by these boilers with that produced by the Project activity.

The development of the Project is in line with local and national industrial policies, and it is undertaken using advanced equipment and technology developed within the country, leading to development gains within the country's industrial R&D sector.

The concerns raised in the answers to the questionnaires and at the stakeholders' meeting were as follows:

1) The production of dioxins during the combustion process,
2) Whether the Project activity's handling process for MSW would lead to any pollution of the local environment, and
3) Whether the proportion of MSW to coal would meet the national standards.

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

The owner addressed the above three concerns as follows:

1) The amount of dioxin produced in the combustion process will be much lower than the national standard (0.1Ng). Through control of the temperature in the furnace and filtration of the flue gas, levels of 0.01Ng (90% lower than the required standard) are expected to be achieved.

2) Leachate released from the MSW during the handling process will be collected and fed back into the boiler. The Project meets both national and EU standards. No new pollution will be produced.

3) The ratio of MSW to coal will be 8:2 by weight, in line with the national standard.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	CECIC Blue-Sky Investment Consulting & Management Co., Ltd
Street/P.O.Box:	No.15 Fucheng Road, Haidian District, Beijing
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URL:	www.cecic-consulting.com.cn
Represented by:	Hang Ding
Title:	
Salutation:	Ms.
Last Name:	Hang
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Department:	
Mobile:	
Direct FAX:	(8610) 88142004
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The financial plans for the Project do not involve any public funding from Annex 1 countries.

Annex 3

BASELINE INFORMATION

Baseline data and information can be found in B.6.

TABLES OF OPERATING MARGING AND BUILD MARGIN CALCULATIONS

(i) Operating Margin:

OM = Total emissions 2003, 2004, 2005/Total power output 2002, 2003, 2004

1.12

CO2 emissions (tCO2e) for the Huabei Grid (2003):

Basic data for the North China Power Grid for 2003

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	ner Mongo	Shandong	Subtotal	EF	)xidation facto	NCV	CO2 Emission
									(tc/TJ)	(%)	(MJ/t,km3)	G*H*I*J*44/12/10000（mass u
												K=G*H*I*J*44/12/1000
		A	B	C	D	E	F	:A+B+C+D+E	H	I	J	(volume unit)
Raw coal	10,000t	714.73	1052.74	5482.64	4528.51	3949.32	6808	**22535.94**	25.8	100	20908	445737636.11
Clean coal	10,000t						9.41	**9.41**	25.8	100	26344	234510.60
Other washed coal	10,000t	6.31		67.28	208.21		450.9	**732.7**	25.8	100	8363	5796681.31
Coke	10,000t					2.8		**2.8**	25.8	100	28435	75318.63
Coke oven gas	10E8 m3	0.24	1.71		0.9	0.21	0.02	**3.08**	12.1	100	16726	228559.67
Other coal gas	10E8 m3	16.92		10.63		10.32	1.56	**39.43**	12.1	100	5227	914399.71
Crude oil	10,000t						29.68	**29.68**	20	100	41816	910139.18
Gasoline	10,000t						0.01	**0.01**	18.9	100	43070	298.48
Diesel	10,000t	0.29	1.35	4		2.91	5.4	**13.95**	20.2	100	42652	440693.26
Fuel oil	10,000t	13.95	0.02	1.11		0.65	10.07	**25.8**	21.1	100	41816	834672.45
LPG	10,000t							**0**	17.2	100	50179	0.00
Refinery gas	10,000t			0.27			0.83	**1.1**	18.2	100	46055	33807.44
Natural gas	10E8 m3		0.5				1.08	**1.58**	15.3	100	38931	345076.60
Other petroleum product	10,000t							**0**	20	100	38369	0.00
Other coking products	10,000t							**0**	25.8	100	28435	0.00
Other energy	10000t ce	9.83					39.21	**49.04**	0	100	0	0.00
											Subtotal	455551793.4

《 China Energy Statistics Yearbook 2004》

MWh	**2003年**
华北从东北净调入	4,244,380

Electricity Generation from the Thermal Power Plants of North China Power Grd (2003)

Province	Electricity Genera		On-site use	Power output
	(KWh)	(MWh)	(%)	(MWh)
Beijing	186.08	18608000	7.52	17208678.4
Tianjin	321.91	32191000	6.79	30005231.1
Hebei	1082.61	108261000	6.5	101224035
Shanxi	939.62	93962000	7.69	86736322.2
Inner Mongolia	651.06	65106000	7.66	60118880.4
Shandong	1395.47	139547000	6.79	130071758.7
Total				425364905.8

《 China Electric Power Yearbook 2004》

Average CO2 EF of the Northeast China Power Grid (2003)

Total CO2 emission	174151899
Total power output	153227363
Average CO2 EF	1.136558745

Net Power Imports from the Northeast China Power Grid (2003)

Total Power Output [MWh]	429609285.8
Total emission, tCO2	460375780.6
EF (tCO2/TJ)	1.071615

CO2 emissions (tCO2e) for the Huabei Grid (2004):

Basic data for the North China Power Grid for 2004

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	ner Mongo	Shandong	Subtotal	EF	xidation facto	NCV	CO2 Emission
									(tc/TJ)	(%)	(MJ/t,km3)	G*H*I*J*44/12/10000(mass u
		A	B	C	D	E	F	A+B+C+D+E	H	I	J	K=G*H*I*J*44/12/1000 (volume unit)
Raw coal	10,000t	823.09	1410	6299.8	5213.2	4932.2	8550	**27228.29**	25.8	100	20908	538547476.6
Clean coal	10,000t						40	**40**	25.8	100	26344	996856.96
Other washed coal	10,000t	6.48		101.04	354.17		284.22	**745.91**	25.8	100	8363	5901190.882
Coke	10,000t					0.22		**0.22**	25.8	100	28435	5917.8922
Coke oven gas	10E8 m3	0.55		0.54	5.32	0.4	8.73	**15.54**	12.1	100	16726	1153187.451
Other coal gas	10E8 m3	17.74		24.25	8.2	16.47	1.41	**68.07**	12.1	100	5227	1578574.385
Crude oil	10,000t							**0**	20	100	41816	0
Gasoline	10,000t								18.9	100	43070	0
Diesel	10,000t	0.39	0.84	4.66				**5.89**	20.2	100	42652	186070.4874
Fuel oil	10,000t	14.66		0.16				**14.82**	21.1	100	41816	479451.3838
LPG	10,000t							**0**	17.2	100	50179	0
Refinery gas	10,000t		0.55	1.42				**1.97**	18.2	100	46055	60546.05223
Natural gas	10E8 m3		0.37		0.19			**0.56**	15.3	100	38931	122305.6296
Other petroleum product	10,000t							**0**	20	100	38369	0
Other coking products	10,000t							**0**	25.8	100	28435	0
Other energy	10000t ce	9.41		34.64	109.73	4.48		**158.26**	0	100	0	0
											Subtotal	549031577.7

《 China Energy Statistics Yearbook 2005》

MWh	**2004年**
华北从东北净调入	4,514,550

Electricity Generation from the Thermal Power Plants of North China Power Grd (2004)

Province	发电量	tricity Genera	On-site use	Power output
	(亿kWh)	(MWh)	(%)	(MWh)
Beijing	185.79	18579000	7.94	17,103,827
Tianjin	339.52	33952000	6.35	31,796,048
Hebei	1249.7	124970000	6.5	116,846,950
Shanxi	1049.26	104926000	7.7	96,846,698
Inner Mongolia	804.27	80427000	7.17	74,660,384
Shandong	1639.18	163918000	7.32	151,919,202
Total				489,173,110

《 China Electric Power Yearbook 2005》

Average CO2 EF of the Northeast China Power Grid (2004)

Total CO2 emission	199754430.5
Total power output	170132885.1
Average CO2 EF	1.17410829

Net Power Imports from the Northeast China Power Grid (2004)

Total Power Output [MWh]	493687659.9	
Total emission, tCO2	554332148.3	
EF (tCO2/TJ)	1.12283979	

CO2 emissions (tCO2e) for the Huabei Grid (2005):

Basic data for the North China Power Grid for 2005

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	ner Mongo	Shandong	Subtotal	EF	)xidation factc	NCV	CO2 Emission tCO2e
									(tC/TJ)	(%)	(MJ/t,km3)	=G*H*I*J*44/12/100(mass uni
		A	B	C	D	E	F	:A+B+C+D+E	H	I	J	K=G*H*I*J*44/12/1000 (volume unit)
Raw coal	10,000t	897.75	1675.2	6726.5	6176.45	6277.23	10405.4	**32158.53**	25.8	100	20908	636062535.8
Clean coal	10,000t						42.18	**42.18**	25.8	100	26344	1051185.664
Other washed coal	10,000t	6.57		167.45	373.65		108.69	**656.36**	25.8	100	8363	5192725.191
Coke	10,000t					0.21	0.11	**0.32**	25.8	100	28435	8607.8432
Coke oven gas	10E8 m3	0.64	0.75	0.62	21.08	0.39		**23.48**	12.1	100	16726	1742396.483
Other coal gas	10E8 m3	16.09	7.86	38.83	9.88	18.37		**91.03**	12.1	100	5227	2111027.27
Crude oil	10,000t					0.73		**0.73**	20	100	41816	22385.49867
Gasoline	10,000t			0.01				**0.01**	18.9	100	43070	298.4751
Diesel	10,000t	0.48		3.54		0.12		**4.14**	20.2	100	42652	130786.3867
Fuel oil	10,000t	12.25		0.23		0.06		**12.54**	21.1	100	41816	405689.6325
LPG	10,000t							**0**	17.2	100	50179	0
Refinery gas	10,000t			9.02				**9.02**	18.2	100	46055	277221.0107
Natural gas	10E8 m3	0.28	0.08		2.76			**3.12**	15.3	100	38931	681417.0792
Other petroleum product	10,000t							**0**	20	100	38369	0
Other coking products	10,000t							**0**	25.8	100	28435	0
Other energy	10000t ce	8.58		32.35	69.31	7.27	118.9	**236.41**	0	100	0	0
											Subtotal	647,686,276

《 China Energy Statistics Yearbook 2006》

MWh	**2005年**
华北从东北净调入	23,423,000

Electricity Generation from the Thermal Power Plants of North China Power Grd (2005)

Province	发电量 (亿kWh)	:tricity Genera (MWh)	On-site use (%)	Power output (MWh)
Beijing	208.8	20880000	7.73	19,265,976
Tianjin	369.93	36993000	6.63	34,540,364
Hebei	1343.48	134348000	6.57	125,521,336
Shanxi	1287.85	128785000	7.42	119,229,153
Inner Mongolia	923.45	92345000	7.01	85,871,616
Shandong	1898.8	189880000	7.14	176,322,568
Total				560,751,013

《 China Electric Power Yearbook 2006》

Average CO2 EF of the Northeast China Power Grid (2005)

Total CO2 emission	207282748	
Total power output	179031569	
Average CO2 EF	1.15779998	

Net Power Imports from the Northeast China Power Grid (2005)

Total Power Output [MWh]	584174013	
Total emission, tCO2	674805425	
EF (tCO2/TJ)	1.15514455	

(ii) Build Margin:

Added capacity in the Huabei Grid (2003-2005):

Installed capacity in the North China Grid, 2005

Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal power	MW	3833.5	6149.9	22333.2	22246.8	19173.3	37332	111068.7
Hydro power	MW	1025	5	784.5	783	567.9	50.8	3216.2
Nuclear power	MW	0	0	0	0	0	0	0
Wind farm and others	MW	24	24	48	0	208.9	30.6	335.5
Total	MW	4882.5	6178.9	23165.7	23029.8	19950.2	37413.4	114620.5

Data source: China Electricity Yearbook 2005

Installed capacity in the North China Grid, 2004

Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal power	MW	3458.5	6008.5	19932.7	17693.3	13641.5	32860.4	93594.9
Hydro power	MW	1055.9	5	783.8	787.3	567.9	50.8	3250.7
Nuclear power	MW	0	0	0	0	0	0	0
Wind farm and others	MW	0	0	13.5	0	111.7	12.3	137.5
Total	MW	4514.4	6013.5	20730	18480.6	14321.1	32923.5	96983.1

Data source: China Electricity Yearbook 2005

Installed capacity in the North China Grid, 2003								
Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal power	MW	3347.5	6008.5	17698.7	15035.8	11421.7	30494.4	84006.6
Hydro power	MW	1058.1	5	764.3	795.7	592.1	50.8	3266
Nuclear power	MW	0	0	0	0	0	0	0
Wind farm and others	MW	0	0	13.5	0	76.6	0	90.1
Total	MW	4405.6	6013.5	18476.5	15831.5	12090.4	30545.2	87362.7
Data source: China Electricity Yearbook 2005								

	2003	2004	2005	Capacity addition(2003-2005)	
Thermal	84006.6	93594.9	111068.7	27062.1	99.28%
Hydro	3266	3250.7	3216.2	-49.8	-0.18%
Nuclear	0	0	0	0	0.00%
Wind	90.1	137.5	335.5	245.4	0.90%
Total	87362.7	96983.1	114620.4	27257.7	100.00%
Capacity addtion	23.78%	15.39%			

Thermal power generation in 2004

Fuel Type	CO2 Emission	
	tCO2	%
Raw coal	636062536	98.21%
Clean coal	1051185.7	0.16%
Other washed coal	5192725.2	0.80%
Coke	8607.8432	0.00%
Crude oil	22385.499	0.00%
Gasoline	298.4751	0.00%
Diesel	130786.39	0.02%
Fuel oil	405689.63	0.06%
Natural gas	681417.08	0.11%
Coke oven gas	1742396.5	0.27%
Other coal gas	2111027.3	0.33%
Refinery gas	277221.01	0.04%
	647686276	100.00%

Emission factor for fossil fuel

Fuel Type	Best Efficiency	Carbon emission （tc/TJ）	Oxidation factor （%）
Raw coal	35.82%	25.8	1
Clean coal	35.82%	25.8	1
Other washed coal	35.82%	25.8	1
Coke	35.82%	25.8	1
Crude oil	47.67%	20	1
Gasoline	47.67%	18.9	1
Diesel	47.67%	20.2	1
Fuel oil	47.67%	21.1	1
Natural gas	47.67%	15.3	1
Coke oven gas	47.67%	12.1	1
Other coal gas	47.67%	12.1	1
Refinery gas	47.67%	18.2	1

Weighted grid emission factor:

	2003	New added capacity (2004-2001)	2004	2005
Total installed capacity	87362.7	27257.8	96983.1	114620.5
Thermal power installed capacity	84006.6	27062.1	93594.9	111068.7
Hydro power installed capacity	3266	-49.8	3250.7	3216.2
Total change	23.78%		15.39%	
Thermal split of new capacity		99.28%		
Weighted emission factor (tCO2/MWh)	0.9460			
Build margin emission factor	0.94			

Annex 4

MONITORING INFORMATION

This has been completed in section B.7.

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