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

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Hunan Yueyang Kaidi Biomass Power Project
Version number of the PDD	05
Completion date of the PDD	22/07/2013
Project participant(s)	**United Kingdom of Great Britain and Northern Ireland** , involved indirectly authorized Participants: Camco International Limited, Camco Carbon Limited **Switzerland** , involved indirectly authorized Participants: Camco International Limited **project owner**, Yueyang Kaidi Green Energy Development Co., Ltd
Host Party(ies)	People's Republic of China
Sectoral scope and selected methodology(ies)	Sectoral Scope 1: energy industries (renewable - / non-renewable sources) Methodology(ies): 1. ACM0006 (Version 09) – "Consolidated methodology electricity generation from biomass residues" 2. "Combined tool to identify the baseline scenario and demonstrate additionality". (Version 02.2) 3. ACM0002 (Version 10) – "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" 4. "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 02) 5. "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (Version 01) 6. "Tool to calculate the emission factor for an electricity system" (Version 02)
Estimated amount of annual average GHG emission reductions	192,849 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Hunan Yueyang Kaidi Biomass Power Project (hereafter referred to as the proposed project) is a biomass utilization project developed by Yueyang Kaidi Green Energy Development Co., Ltd. (hereafter referred to as the Project Owner) and is located in Economic Management Zone, Quyuan Management District, Yueyang City, Hunan Province, P.R. China.

The scenario existing prior to the start of implementation of the project activity is the generation of power by grid-connected power plants, generation of heat in small coal-fired boilers and the biomass residues(Rice husk, Rice straw, Maize straw ,Wood chips, Branches and Barks) are dumped or left to decay under mainly aerobic conditions. The latter applies to, for example, dumping and decay of biomass residues on fields or burnt in an uncontrolled manner without utilizing it for energy purposes.

The proposed project will process about 485,800tonnes (wet) of biomass residue annually, of which Rice husk, Rice straw, Maize straw ,Wood chips, Branches and Barks are the main biomass fuel. 4 sets of 65t/h Circulating Fluidized Bed (CFB) boiler and 4 sets of 12MW steam turbines generator units will be installed. Therefore, the total installed capacity of the Project is 48MW. The annual equivalent operation hours at full load is estimated to be 6000 hours with a net electricity generation of 253,440MWh and a net heat generation of 1,083,204GJ per year.

The proposed project will not claim GHG emission reductions from displacing heat that would otherwise be produced within Quyuan Management District. The estimated average GHG emission reduction is 192,849 tCO_2e per year in the first crediting period.

The electricity generated will be transmitted through two 110kV outlet circuit, one of which is connected to Quyuan Substation and another of which is connected to Hongjiapo Substation and then supplied to Hunan power grid, which is a sub-grid of the Central China Power Grid (CCPG). The proposed project will therefore replace the equivalent capacity of power plants on the CCPG, which is predominantly made up of coal fired power plants. The heat generated will be supplied to the plants in Quyuan Management District to meet the process heat demand and replace the heat generated in the individual small coal-fired boilers.

Additionally, the proposed project will accomplish an extra benefit of greenhouse gas (GHG) mitigation derived from a reduction of methane emissions by utilizing biomass residues from the local area which would otherwise be dumped or left decay under mainly aerobic conditions and burned in an uncontrolled manner outside in the fields.

The baseline scenario is the same as the scenario existing prior to the starting of implementation of the project activity.

The proposed project will not only supply renewable electricity to the grid thereby generating emission reductions, but it will also contribute to sustainable development of the local community and the host country by means of:

- Supplying clean renewable energy to the CCPG with improvements to the local energy structure;
- Promoting the comprehensive utilization of resources and mitigating emissions caused by decay or uncontrolled burning of the biomass residues;
- Increasing local incomes and providing 113 job opportunities;

- Decreasing GHG emissions from the fossil-fuel fired power plants and the GHG emissions from the uncontrolled burning of the biomass residues as well as decreasing emissions of SO_x, NO_x and dust.

In order to meet the requirements in Page 6 and 7 of the applied methodology, the situation of the project activity and baseline scenario has been discussed as follows:

➢ *For each power plant that was operating at the project site during the most recent three years prior to the start of the project activity: the type and capacity of the power plant, types and quantities of fuels have been used in the power plant during the most recent three years prior to the start of the project activity and whether the plant continues operation after the start of the project activity;*

♦ The project activity is a Greenfield project and there is no power plant that was operating at the project site during the most recent three years prior to the start of the project activity.

➢ *For each boiler or other heat generation equipment that was operating at the project site during the most recent three years prior to the start of the project activity: the type and capacity of the boiler, types and quantities of fuels have been used in the boiler during the most recent three years prior to the start of the project activity and whether the boiler continues operation after the start of the project activity;*

♦ The project activity is a Greenfield project and there is no boiler or heat generation that was operating at the project site during the most recent three years prior to the start of the project activity.

➢ *For each boiler or power plant installed under the project activity: the type and capacity of boilers and/or power plants and which types and quantities of fuels are planned to be used;*

♦ The specification of the boilers and turbines installed under the project activity are described in the PDD section A.3. The main fuel of the project activity is biomass residues (Rice husk, Rice straw, Maize straw, Wood chips, Branches and Barks).Diesel will be used as the start-up fuel and there will be some diesel consumption for forklifts at collections sites and project site under the project activity.

➢ *For each new boiler or power plant that would be installed in the absence of the project activity: the type and capacity of the new boilers and/or power plants and which types and quantities of fuels would be used."*

♦ There are some existing off-site boilers that were operating at the Quyuan Management District, the type, capacity and location of the boiler, type and quantities of fuels have been used in each of the boilers during the most recent three years prior to the start of the project activity have been described in detail in PDD section A 3.

A.2. Location of project activity

A.2.1. Host Party(ies)

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People's Republic of China

A.2.2. Region/State/Province etc.

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Hunan Province

A.2.3. City/Town/Community etc.

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Yueyang City

A.2.4. Physical/Geographical location

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The proposed project activity is located in the Economic Management Zone, Quyuan Management District, Yueyang City, Hunan Province, P.R. China, which is west to Renhe Road, east to Tangliang Roas and south to Yuefei Road.

The center of plant has geographical coordinates of 112°54′30″ east longitude 28°51′18″ north latitude.

FigureA-1 shows the location of the proposed project.

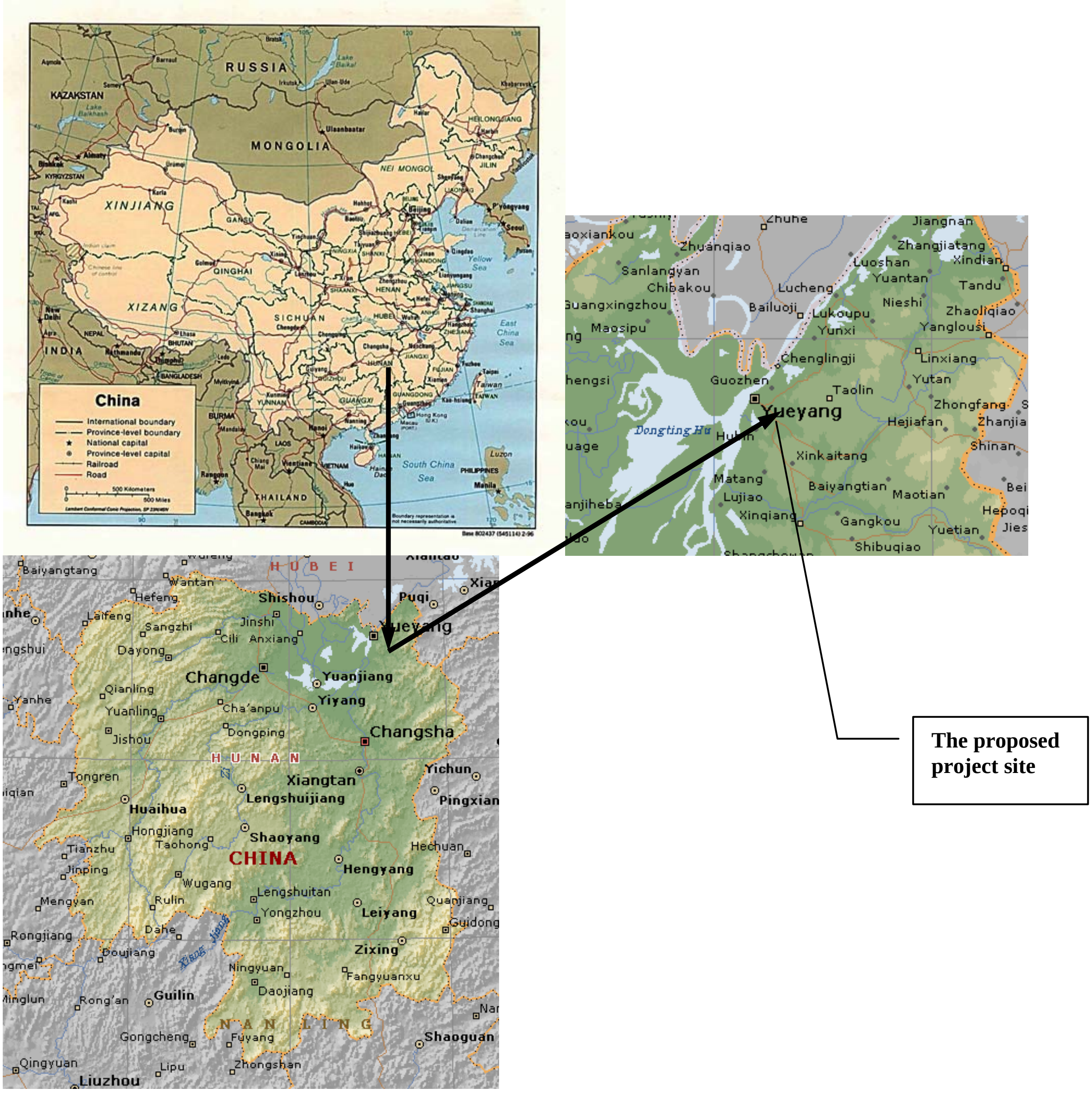

Figure A-1. The location of Hunan Yueyang Kaidi Biomass Power Project

A.3. Technologies and/or measures

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<u>**Scenario prior to the start of the implementation of the project activity:**</u>

- The equivalent electricity is supplied from the CCPG which is dominated by coal-fired power plants.
- The process heat demand in the Quyuan Management District is or would be met by individual small coal-fired boilers.

The existing heat demand in the Quyuan Management District is around 28t/h, which is met by individual small coal-fired boilers owned by each plant owner[1]. The key information on each individual coal-fired boiler is detailed as below：

Table A-1 The existing fossil fuel-fired off site boilers in the Quyuan Management District[2].

Owner	**Rated Capacity (t/h)**	**Commission starting date (year)**	**Predicted date of replacement**	**Model**	Fuel/ Consumption	Distance from the Project	Coordinates
Hunan Sanren S&T Development Co., Ltd	6	2005	2030	DZL6-1.25-AII	Coal 3,600ton per year	4km	E112°56′49″ N28°50′56″
Yueyang Chaoyang S&T Development Co., Ltd	6	2003	2028	DZL6-1.25-AII	Coal 3,600ton per year	4km	E112°56′18″ N28°50′11″
Hunan Zhenghong Haiyuan Green Food Co., Ltd	6	2002	2027	SZL6-1.57-AII	Coal 3,600ton per year	3km	E112°55′37″ N28°50′18″
Hunan Zhenghong Haiyuan Green Food Co., Ltd	6	2002	2027	SZL6-1.57-AII	Coal 3,600ton per year	3km	E112°56'26″ N28°52′37″
Yueyang Quyuan S&T Development Co., Ltd	4	2006	2031	DZH4-1.25-AII WII	Coal 2,400ton per year	3km	E112°56′37″ N28°50′52″

Note: The design lifetime for those kinds of boilers is 30 years[3]. The average commercial lifetime is above 25 years[4] therefore a 25 year lifetime is used in the table above to calculate the predicted year of replacement to be conservative.

Although coal-fired boilers for process heat supply are common practice in local area, the small coal fired boilers have a negative impact on the local environment. In consideration of the negative impact on the local environment and in order to build a green, environmental friendly industrial park, the Industry

[1] " Introduction on the boilers in Quyuan Management District", official letter of Industry Economic Bureau of Quyuan Management District
" Supplementary Introduction on the boilers in Quyuan Management District", official letter of Industry Economic Bureau of Quyuan Management District
[2] ibid
[3] Boiler intensity calculation standards application manual, standards press of China,1998 page11
[4] "Introduction on the lifetime of the boilers" by the Senior Engineer Zhu yuqing from Central Southern China Electric Power Design Institute of China Power Engineering Consulting Group

Economic Bureau of Quyuan Management District is willing to let the proposed project to provide heat to the individual heat users within the industrial park to meet the heat demand. The official document issued by the Industry Economic Bureau of Quyuan Management District[5] states that the existing boilers at the consumer site should stop operation when the proposed project is supplying heat.

Additionally, in another official document issued by Industry Economic Bureau of Quyuan Management District, it also states that to provide better infrastructure for the industrial park, the local government will bear the capital cost on the heat pipeline for transporting steam to the independent heat users within Quyuan Management District[6].

- The biomass residues which are to be utilized in the proposed power plant are currently dumped or left decay under mainly aerobic conditions and burned in an uncontrolled manner outside in the fields.

Baseline Scenario:
The baseline scenario is the same as the scenario prior to the start of the implementation of the project activity as described above. In the absence of the proposed project, this scenario will continue.

Project Activity Scenario:
The technology employed by the proposed project is advanced domestic technology. The proposed project will install four sets of 65t/h circulating fluid bed (CFB) boilers with medium temperature and sub-high pressure. At the same time, four 12MW steam turbines and four associated generators will be applied in the proposed project .The steam turbine employed is medium temperature and sub-high pressure extraction condensing steam turbine. The total installed capacity of the proposed project is 48MW, and the total efficiency of the plant is approximately 42%.

The key technical specifications of the boiler, turbine and generator are listed in the table below.

TableA-2 Key Equipments Parameters:[7]

BOILER	
Manufacturer	Jiangxi Jianglian Energy and Environmental Protection Co., Ltd
Model	KG65-450/5.29-FSWZ－Ⅰ
Type	Medium temperature and sub-high pressure Circulating Fluidized Bed
Maximum evaporation volume	65t/h
Rated steam pressure	5.29MPa
Rated steam temperature	450℃
Feed water temperature	153.2℃
Feed water pressure	5.72MPa
Efficiency	≥86 %

5 " Introduction on the boilers in Quyuan Management District", official letter of Industry Economic Bureau of Quyuan Management District
6 Clarifications on taking Yueyang Kaidi Biomass Power Generation Project as the district heating system in Quyuan Management District, QuGongJingHan [2010] 3
7 Equipment purchase Agreement,Annex1, from the Project Owner

Quantity	4
STEAM TURBINE	
Manufacturer	NanJing Steam Turbine(Group) Co., Ltd
Model	C12-4.90/0.981-12/435℃.
Type	Medium temperature and sub-high pressure extraction condensing steam turbine
Rated power	12MW
Main steam pressure	4.9MPa.a
Main steam temperature	435℃
Rate extraction steam volume	15t/h
Maxium Extraction steam volume when Rate electricity capacity is 6.59MW	45t/h
Quantity	4
GENERATOR	
Manufacturer	NanJing Steam Turbine(Group) Co., Ltd
Model	QFJ-15-2
Rated power	15MW[8]
Rated voltage	10.5KV
Power factor	0.8
Efficiency	≥97%
Rated rotating speed	3000r/min
Rated frequency	50Hz
Quantity	4

The biomass residues utilized in this proposed project will be mainly Rice husk, Rice straw, Maize straw, Wood chips, Branches and Barks. The rice husk will be packed and stored temporarily at the rice mills. Some collection sites will be set up near to the resources for the biomass residues to be processed and stored temporarily, from where the biomass residues will be transported to the plant according to the dispatch schedule. At the same time, some
Biomass residues will be transported to the project plant directly.

The biomass residues are weighed by the weighbridge before being fed into the fuel entering system to the boiler for combustion or into the storehouse in the plant for future usage. The steam entered into the turbine is used for power generation and some is extracted for heat supply. The heat generated by the proposed project will be supply to the local industrial users as process heat in the industrial park.

[8] The generator is sized at 15MW and not 12MW to allow for possible peak generation and to avoid damage to the generation unit by sudden load change in abnormal situations.

The boiler smoke will be treated by a high efficiency bag filter and then carried to the ash storeroom. It is estimated that the annual ash generated from the power plant will be very limited. The ash is expected to be transported outside of the plant and dealt with by some local fertilizer company.

All of the turbine and generator system will be supplied by Chinese domestic suppliers as well as the other auxiliary equipments installed in the power plant.

A flow diagram showing the power plant operation is provided as below.

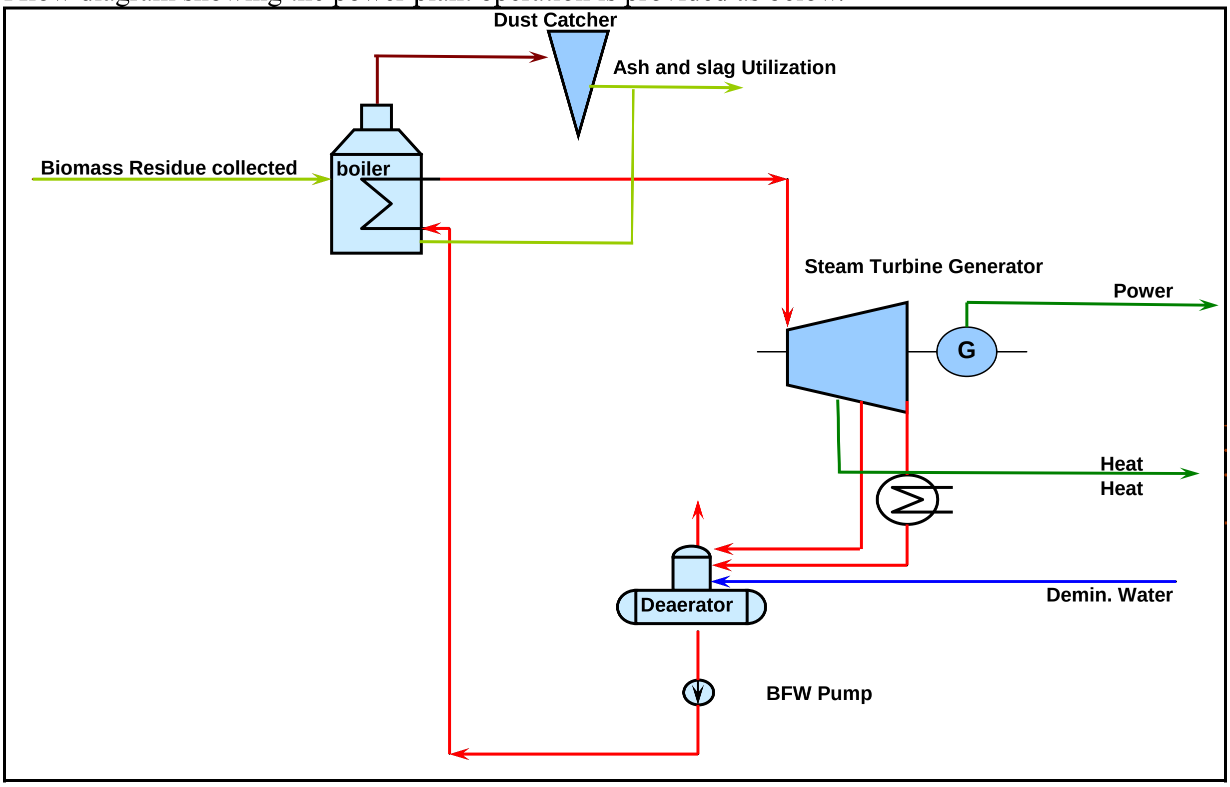

Figure A-2 Flow Diagram of the plant

A.4. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Peoples' Republic of China (host)	Yueyang Kaidi Green Energy Development Co., Ltd	No
United Kingdom	Camco International Limited	No
United Kingdom	Camco Carbon Limited	No
Switzerland	Camco International Limited	No

A.5. Public funding of project activity

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There is no public funding for this project.

SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

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7. ACM0006 (Version 09) – "Consolidated methodology electricity generation from biomass residues"
8. "Combined tool to identify the baseline scenario and demonstrate additionality". (Version 02.2)
9. ACM0002 (Version 10) – "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"
10. "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 02)
11. "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (Version 01)
12. "Tool to calculate the emission factor for an electricity system" (Version 02)

For more information regarding the methodology, please refer to the link:

http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

B.2. Applicability of methodology

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ACM0006 is applicable to biomass residue fired electricity generation project activities, including cogeneration plants. The proposed project is a Greenfield power cogeneration project on the operation of an independent plant supplied by biomass residues coming from the nearby area.

The proposed project meets all applicability conditions of ACM0006 which are justified as follows:

Applicable conditions of ACM0006	**Justification on the applicability of ACM0006 to the Proposed Project**
No other biomass types than biomass residues, as defined in the methodology, are used in the project plant and these biomass residues are the predominant fuel used in the project plant (some fossil fuels may be co-fired);	Biomass residues (Rice husk, Rice straw, Maize straw, Wood chips, Branches and Barks) from local agriculture will be the predominant fuel at the power plant. Only a small amount of diesel will be used for start-up of the boilers.
For projects that use biomass residues from a production process, the implementation of the project shall not result in an increase of the processing capacity of raw input or in other substantial changes in this process;	The biomass residues used by the proposed project are byproducts of agriculture crops and forestry, not from a production process.
The biomass residues used by the project facility should not be stored for more than one year;	The biomass residues are consumed on a first-come-first-used basis. According to the FSR, a regular clearance of the warehouse at the power plant will happen every four months. Thus, the biomass residues will not be stored more than one year.
No significant energy quantities, except from transportation or mechanical treatment of the biomass residues, are required to prepare the biomass residues for fuel combustion, i.e. projects that process the biomass residues prior to	The preparation of the biomass residues only includes mechanical treatment or transportation. Therefore, the proposed project will not have significant consumption of fossil fuels.

combustion (e.g. esterification of waste oils).	

Besides, the baseline scenario of the project activity corresponds to the" description of the situation" of scenario 2 -one of the scenarios described in Table 2 in the methodology which has been discussed in B.4.

Therefore, ACM0006 is applicable to the proposed project.

B.3. Project boundary

Emission sources:

For the purpose of determining GHG emissions of the **project activity**, the following emission sources are included:
•CO2 emissions from on-site fossil fuel and electricity consumption that is attributable to the project activity
•CO2 emissions from transportation of biomass residues to the project site

For the purpose of determining **baseline emissions**, the following emission sources are included:
•CO2 emissions from fossil fuel fired power plants connected to the electricity system
•The project participants have chosen not to claim CO2 emissions from fossil fuel based heat generation.

According to the approved methodology ACM0006, where the most likely baseline scenario for the biomass residue use is that the biomass residues would be dumped or left to decay under aerobic or anaerobic conditions or would be burnt in an uncontrolled manner without utilizing it for energy purposes, project participants may decide whether to include CH4 emissions in the project boundary.

For this project, CH4 emissions are **included** and these emissions are included in both the calculations for determining project emissions and baseline emissions.

According to the approved methodology ACM0006, the emission sources and GHGs in the project boundary are listed in the following table.

Table B-1 Overview on emissions sources included in or excluded from the project boundary

Source		**GHGs**	**Included?**	**Justification / Explanation**
Baseline scenario scenario	Electricity generation	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Uncontrolled burning or decay of surplus biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Included	A combination of B1 and B3 is the most likely baseline scenario, and project participant decide to include this source of the proposed project.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Heat generation	CO_2	Excluded	The project activity will not claim CO2 emissions from fossil fuel based heat generation.
		CH_4	Excluded	Excluded for simplification. This is conservative.

		N_2O	Excluded	Excluded for simplification. This is conservative.
Project scenario	On-site fossil fuel and electricity consumption due to the project activity	CO_2	Included	May be an important emission source by the project activity
		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.
	Off-site transportation of biomass residues	CO_2	Included	May be an important emission source by the project activity
		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.
	Combustion of biomass residues for electricity and / or heat generation	CO_2	Excluded	It is assumed that CO2 emission from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Included	Since the CH_4 emissions of biomass residue are included in baseline, according to the methodology, this emission is included in project scenario.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.
	Storage of biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	Excluded for simplification. Since biomass is stored for not longer than one year, this emission source is assumed to be small.
		N_2O	Excluded	For simplification. This emission source is assumed to be very small.
	Waste water from the treatment of biomass residues	CO_2	Excluded	It is assumed that CO2 emission from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	No waste water generated during Biomass residue treatment. Therefore, no anaerobic treatment is involved during the treatment of biomass residues
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.

Spatial Extent of the Project Boundary:

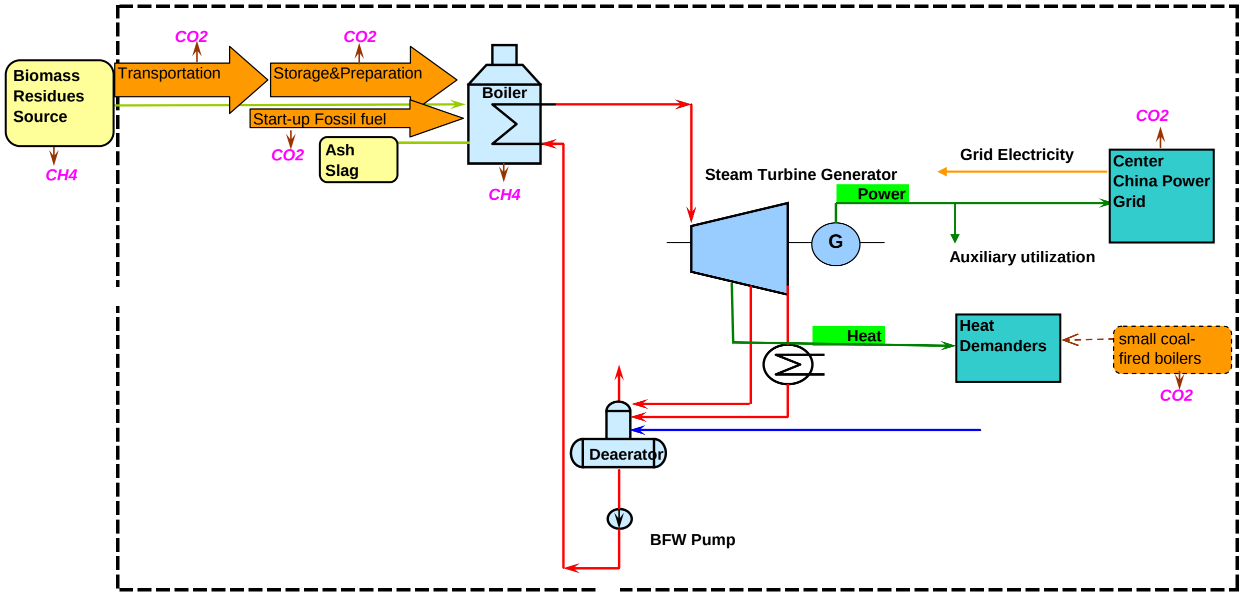
The spatial extent of the project boundary encompasses

- The power plant at the project site;
- Transportation of biomass residues by trucks to the project site;
- All power plants connected physically to the Central China Power Grid (CCPG). The CCPG includes Henan Province, Hubei Province, Hunan Province, Jiangxi Province, Sichuan Province and Chongqing City according to published information by the China DNA[9].

[9] http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=3239

- The sites where the biomass residues would have been left for decay or dumped.
- The biomass collection sites where the biomass residues will be pretreated

The heat users are included in the project boundary to account for revenues from selling thermal energy, but they are not considered in the determination of baseline emissions since the project participants have chosen not to claim CO2 emissions from fossil fuel based heat generation.



FigureB-1 Project Boundary

B.4. Establishment and description of baseline scenario

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According to the latest methodology ACM0006, "Combined Tool to identify the baseline scenario and demonstrate additionality"(Version02.1) should be used to identify the most plausible baseline scenario and demonstrate additionality.

This tool applies the following four steps:
STEP 1 Identification of alternative scenarios
STEP 2 Barrier analysis
STEP 3 Investment analysis (If applicable)
STEP 4 Common practice analysis

STEP 1. Identification of alternative scenarios

This step serves to identify all alternative scenarios to the proposed CDM project activity(s) that can be the baseline scenario through the following sub-steps:

Sub-step 1a. Define alternative scenarios to the proposed CDM project activity

Realistic and credible alternatives should be separately determined regarding:

- How power would be generated in the absence of the CDM project activity;
- What would happen to the biomass residues in the absence of the project activity;

- How the heat would be generated in the absence of the project activity.

According to ACM0006, all the baseline alternatives for **power generation are listed and discussed as follows:**

Table B-2 Define alternatives for power generation

Alternatives	**Realistic and credible alternative scenario? Yes/No**
P1 The Project not undertaken as a CDM project activity.	**Yes.** Despite the fact that this alternative is economically unattractive, as analysed in step3, this alternative is a plausible scenario for further analysis.
P2 The continuation of power generation in an existing biomass residue fired power plant at the project site, in the same configuration, without retrofitting and fired with the same type of biomass residues as (co-)fired in the Project.	**No.** Since the proposed project is a greenfield project and there is no existing biomass residues fired power plant at the project site, therefore this alternative is excluded.
P3 The generation of power in an existing captive power plant, using only fossil fuels.	**No.** Since there is no existing captive power plant, using fossil fuels near the project site, therefore this alternative is excluded.
P4 The generation of power in the grid	**Yes.** This alternative is a plausible scenario for further analysis.
P5 The installation of a new biomass residue fired power plant, fired with the same type and with the same annual amount of biomass residues as the Project, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industrial sector) than the Project plant and therefore with a lower power output than in the Project case.	**No.** Since biomass power plants including the lower efficiency ones are not common practice in the local area. There is no on-grid installed capacity from Biomass Power plant before 2007 in Hunan Province[10]. Therefore, this alternative is excluded.
P6 The installation of a new biomass residue fired power plant that is fired with the same type but with a higher annual amount of biomass residues as the Project and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industrial sector) than the Project. Therefore, the power output is the same as in the Project	**No.** Since biomass power plants are not common practice in the local area. There is no on-grid installed capacity from Biomass Power plant before 2007 in Hunan Province[11]. Besides, the installation of a new biomass residue fired power plant fired with more biomass residues than the project plant is more financially unattractive than the proposed project; Therefore, this alternative is excluded.
P7 The retrofitting of an existing biomass residue fired power, fired with the same type and with the same annual amount of biomass residues as the	**No.** Since the proposed project is a greenfield project and there is no existing biomass residues fired

[10] China Electric Power Yearbook ,2007,2006,2005,2004,2003
[11] ibid

Project, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industrial sector) than the Project plant and therefore with a lower power output than in the Project case.	power plant at the project site, therefore this alternative is excluded.
P8 The retrofitting of an existing biomass residue fired power that is fired with the same type but with a higher annual amount of biomass residues as the Project and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industrial sector) than the Project.	**No.** Since the proposed project is a greenfield project and there is no existing biomass residues fired power plant at the project site, therefore this alternative is excluded.
P9 The installation of a new fossil fuel fired captive power plant at the project site	**Yes.** This alternative is a plausible scenario for further analysis.
P10 The installation of a new single- (using only biomass residues) or co-fired (using a mix of biomass residues and fossil fuels) cogeneration plant with the same rated power capacity as the project activity power plant, but that is fired with a different type and/or quantity of fuels (biomass residues and/or fossil fuels). The annual amount of biomass residue used in the baseline scenario is lower than that used in the project activity.	**No.** Firstly, since biomass cogeneration plants (including single-or co-fired cogeneration plants) are not common practice in the local area. There is no on-grid installed capacity from Biomass Cogeneration plant before 2007 in Hunan Province[12] . Secondly, there are no other biomass resources identified in the biomass availability report and as such no other viable biomass fuel options available. It is financially unattractive to use some biomass types that are not identified in the biomass availability report. Thirdly, the *Renewable Energy Electricity Tariff and Cost Management Trial Regulations (fagaijiage [2006] 7)* issued by NDRC of China in 2006 stipulates that " if the energy consumption from the fossil fuel of a co-fired(using a mix of biomass residues and fossil fuels) power plant exceeds 20% of the total energy consumption, the project should be taken as a ordinary fossil fuel fired project", which means the tariff of the project within the first 15 years since commissioning will be only the bus-bar tariff for Hunan Province(0.403RMB/KWh including VAT)without 0.25RMB/KWh as the subsidy. Thus, it is not financially feasible to build new co-fired biomass power project in the region at present.

[12] ibid

	Therefore this alternative is excluded.
P11 The generation of power in an existing fossil fuel fired cogeneration plant co-fired with biomass residues, at the project site.	**No.** Since there is no existing fossil fuel fired cogeneration plant co-fired with biomass residues near the project site, therefore this alternative is excluded.

According to ACM0006, all the baseline alternatives for **Heat generation** are listed and discussed as follows:

Table B-3 Define alternatives for Heat Generation

Alternatives	**Realistic and credible alternative scenario? Yes/No**
H1 The Project not undertaken as a CDM project activity.	**Yes.** Despite the fact that this alternative is economically unattractive, as analyzed in Step3, this alternative is a plausible scenario for further analysis.
H2 The proposed project activity(installation of a cogeneration power plant), fired with the same type of biomass residues but with a different efficiency of heat generation (e.g. an efficiency that is common practice in the relevant industrial sector)	**No.** Since at present the technology of biomass cogeneration in China is just started and there is no on-grid installed capacity from Biomass Power plant before 2007 in Hunan Province[13]. Thus it is not common practice in China no matter lower efficiency or higher efficiency, therefore this alternative is excluded.
H3 The generation of heat in an existing captive cogeneration plant, using only fossil fuels.	**No.** Since there is no fossil fuel fired cogeneration plant or any other cogeneration plant at or around the project site[14].
H4 The generation of heat in boilers using the same type of biomass residues.	**No.** Since there is no heat boiler using biomass residues in the local area, while using small coal-fired boiler is common practice to meet the process heat demand for the plants in the industrial park, besides, it is not feasible for the individual enterprise to be equipped with expertise on the biomass collection or biomass-boiler operation.
H5 The continuation of heat generation in an existing biomass residue fired cogeneration plant at the project site, in the same configuration, without retrofitting and fired with the same type of biomass residues as in the Project.	**No.** Since there is no biomass residue fired cogeneration plant at or around the project site[15]. Therefore, this alternative is excluded.

[13] ibid
[14] A letter from Yueyang City Quyuan District Investment Promotion Bureau about the clarification on no existing biomass power plant or underway except the proposed project or biomass energy project in Yueyang City
[15] ibid

H6 The generation of heat in boilers using fossil fuels.	**Yes.** As discussed in section A.3, existing heat demand is met by small fossil fuel fired boilers[16]. In the absence of the proposed project, the industrial heat demand will continue to be met the individual small fossil fuel fired boilers. Therefore, this alternative is a plausible scenario for further analysis.
H7 The use of heat from external sources, such as district heat.	**No.** Since there is no district heat supply in the local area, heat sources from external sources such as district heating do not exist. Besides, there is no plan to build district heat system in Yueyang City[17]
H8 Other heat generation technologies (e.g. heat pumps or solar energy).	**No.** Since the heat consumers for the project are those enterprises located in the industrial park. They require a huge amount of qualified steam, therefore neither solar energy nor heat pumps are feasible heat supply alternatives that could meet the quality nor the quantity of the process heat needed in the industrial park.
H9 The installation of a new single- (using only biomass residues) or co-fired (using a mix of biomass residues and fossil fuels) cogeneration plant with the same rated power capacity as the project activity power plant, but that is fired with a different type and/or quantity of fuels (biomass residues and/or fossil fuels). The annual amount of biomass residue used in the baseline scenario is lower than that used in the project activity.	**No.** Firstly, since biomass cogeneration plants (including single-or co-fired cogeneration plants) are not common practice in the local area. There is no on-grid installed capacity from Biomass Cogeneration plant before 2007 in Hunan Province[18] . Secondly, there are no other biomass resources identified in the biomass availability report and as such no other viable biomass fuel options available. It is financially unattractive to use some biomass types that are not identified in the biomass availability report. Thirdly, the *Renewable Energy Electricity Tariff and Cost Management Trial Regulations (fagaijiage [2006] 7)* issued by NDRC of China in

16 " Introduction on the boilers in Quyuan Management District", official letter of Industry Economic Bureau of Quyuan Management District "

17 At the validation site visit on October 30, 2008, Yueyang City officials attended and confirmed that there are no future plans for district heating in Yueyang City.

18 ibid

	2006 stipulates that " if the energy consumption from the fossil fuel of a co-fired(using a mix of biomass residues and fossil fuels) power plant exceeds 20% of the total energy consumption, the project should be taken as a ordinary fossil fuel fired project", which means the tariff of the project within the first 15 years since commissioning will be only the bus-bar tariff for Hunan Province(0.403RMB/KWh including VAT)without 0.25RMB/KWh as the subsidy. Thus, it is not financially feasible to build new co-fired biomass power project in the region at present. Therefore this alternative is excluded.
H10 The generation of power in an existing fossil fuel fired cogeneration plant co-fired with biomass residues, at the project site.	**No.** Since there is no existing fossil fuel fired cogeneration plant co-fired with biomass residues near the project site, therefore this alternative is excluded.

According to ACM0006, all the baseline alternatives for **the use of biomass residues** are listed and discussed as follows:

Table B-4 Define alternatives to each biomass type

Alternative	**Realistic and credible alternative scenario? Yes/No**	
	Rice Husk	**Straw and Forestry residues** ***(Including*** **Rice straw, Maize straw, Wood chips, Branches and Barks*)***
B1 The biomass residues are dumped or left to decay under mainly aerobic conditions. This applies, for example, to dumping and decay of biomass residues on fields.	**Yes.** The availability of the rice husk which has been investigated by the FSR institute with support from the local authorities[19] shows that55,400 tons of the rice husk are used for other purposes which only takes up 20% of the total available rice husk generated in the region (277,100 tons), with the rest (80%) left to decay under mainly aerobic conditions or burnt in an uncontrolled manner without utilizing it. The rice mills have limited room for the rice husk and they have to burn it or dump it to leave room for the rice. Therefore, this alternative is a plausible scenario for further analysis.	**Yes.** The availability of the straws which has been investigated by the FSR institute with support from the local authorities[20] shows that 353,200 4 tons of the straws were used for other purposes which only takes up 20% of the total available straws generated in the region (1,766,000tons), with the rest (80%) left to decay under mainly aerobic conditions or burnt in an uncontrolled manner without utilizing it. The investigation report shows that74,300 tons of the forestry residues were used for other purpose which only takes up 15% of the total available forestry residues generated in the region (495,000 tons), with the rest (85%) left to decay under mainly aerobic conditions or burnt in an uncontrolled manner without utilizing it. The local farmers have to get rid of a huge amount of straw in order to keep the land free for the next season's planting, so they burn the straw in the field. Therefore, this alternative is a plausible scenario for

[19] Biomass Availability Report of the proposed project, Wuhan Kaidi Electric Power Engineering Co., Ltd., 2011

[20] Biomass Availability Report of the proposed project, Wuhan Kaidi Electric Power Engineering Co., Ltd., 2011

		further analysis.
B2 The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to deep landfills with more than 5 meters. This does not apply to biomass residues that are stock-piled or left to decay on fields.	**No.** It is common that the biomass residues are dumped or left to decay under mainly aerobic conditions and burned in an uncontrolled way outside in the fields. In China, landfill plant only collects and processes the residential waste which does not cover the waste from agricultural and industrial sector, like the rice husk.	**No.** It is common that the biomass residues are dumped or left to decay under mainly aerobic conditions and burned in an uncontrolled way outside in the fields. In China, landfill plant only collects and processes the residential waste which does not cover the waste from agricultural and industrial sector, like the straws and forestry residues.
B3 The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes.	**Yes.** As for Alternative B1. This alternative is a plausible scenario for further analysis.	**Yes.** As for Alternative B1. This alternative is a plausible scenario for further analysis.
B4 The biomass residues are used for heat and/or electricity generation at the Project site	**No.** Since there is no heat or power generation plant using rice husk at the project site, therefore, this alternative is not plausible.	**No.** Since there is no heat or power generation plant using straw and forestry residue at the project site, therefore, this alternative is not plausible.
B5 The biomass residues are used for power generation, including cogeneration, in other existing or new grid-connected power plants	**No.** Using biomass to generate electricity or heat is not common practice in this region: near the project site, there are no existing power plants (including) cogeneration projects or boilers which are using rice husks to generate energy. Besides, confirmed by Yueyang City Quyuan District Investment Promotion Bureau, there will be no other biomass power plant except the proposed project and there will be no other biomass energy projects in Yueyang City[21].	**No.** Using biomass to generate electricity or heat is not common practice in this region: near the project site, there are no existing power plants (including) cogeneration projects or boilers which are using straws and forestry residues to generate energy. Besides, confirmed by Yueyang City Quyuan District Investment Promotion Bureau, there will be no other biomass power plant except the proposed project and there will be no other biomass energy projects in Yueyang City [22].

[21] A letter from Yueyang City Quyuan District Investment Promotion Bureau about the clarification on no existing biomass power plant or underway except the proposed project or biomass energy project in Yueyang City
[22] ibid

B6 The biomass residues are used for heat generation in other existing or new boilers at other sites.	**No.** As for Alternative B5.	**No.** As for Alternative B5.
B7 The biomass residues are used for other energy purposes, such as the generation of biofuels	**No.** There are no projects using biomass residues like rice husk for other energy purposes at the project site now or in Yueyang City's development plan[23]. Besides, due to the high cost in the biofuels projects, the biofuel industry in China just started development and the biomass used for the biofuels are crops or non-crops plants mainly including the broomMaize, cassavas, sweet potato, Coptis chinensis, hairy chestnut, tung tree, palm oil or waste cooking oil and/or waste fat from biogenic origin[24]. The biomass residues used in the proposed project are not common raw material to produce biofuel.	**No.** There are no projects using biomass residues like straws and forestry residues for other energy purposes at the project site now or in Yueyang City's development plan[25]. Besides, due to the high cost in the biofuels projects, the biofuel industry in China just started development and the biomass used for the biofuels are crops or non-crops plants mainly including the broomMaize, cassavas, sweet potato, Coptis chinensis, hairy chestnut, tung tree, palm oil or waste cooking oil and/or waste fat from biogenic origin[26]. The biomass residues used in the proposed project are not common raw material to produce biofuel.
B8 The biomass residues are used for non-energy purposes, e.g. as fertilizer or as feedstock in processes (e.g. in the pulp and paper industry)	**No**. Around55,400 tons of rice husk within the collection radius are used as feedstuff, which only accounts for 20% of the total rice husk availability and according to the leakage analysis in Section B.6.1, the rice husk is quite abundant surplus, the project will not change the use of rice husk as feedstuff.	**No**. Around353,200,523 tons of the straws and 74,300 tons of forestry residues within the collection radius are used as household fuel, feedstuff and fertilizer which only accounts for 20% of the total straws and 15% of the total forestry residues availability respectively and according to the leakage analysis in Section B.6.1, the straws are quite abundant surplus, the project will not change the use of straws and forestry residues as their non-energy

[23] ibid
[24] Interim Rules on management on demonstration non-food biofuels projects (Consultative Draft) Dated in 2007 issued by NDRC of China
[25] A letter from Yueyang City Quyuan District Investment Promotion Bureau about the clarification on no existing biomass power plant or underway except the proposed project or biomass energy project in Yueyang City
[26] Interim Rules on management on demonstration non-food biofuels projects (Consultative Draft) Dated in 2007 issued by NDRC of China

		uses as household fuel, feedstuff and fertilizer.

To summarize, alternatives **P1, P4, P9, H1 ,H6 ,B1, and B3 are** plausible alternatives for further analysis for rice husk, straws and forestry residues.

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B.5. Demonstration of additionality
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Outcome of Step 1a:
As described above, the plausible alternative alternatives for the proposed project are **P1, P4** and **P9** for power generation, **H1 and H6** for heat generation and **B1** and **B3** for the biomass residues

Sub-step 1b. Consistency with mandatory applicable laws and regulations:
In this sub step, alternatives which are not compliance with laws and regulations will be eliminated:

Alternatives P9 is not consistent with mandatory applicable laws and regulations. In 2006, the average annual utilization hour of Chinese fuel-fired power equipments is 5612 hours[27]. Considering the same annual electricity generation, the alternative baseline scenario for the proposed project should be a fuel-fired power plant with installed capacity of 51MW. Furthermore, given that the proposed project is a grid-connected project, the alternative baseline scenario must be a grid-connected fuel-fired power project.

According to Chinese power regulations, it is prohibited to construct fuel-fired power plants of less than 135MW[28] in the areas covered by large grids. The alternative of building a fossil fuel-fired power plant with installed capacity of 51MW conflicts with Chinese regulations. Therefore, **P9** is excluded.

Outcome of Step 1b:

The plausible alternative scenarios are compliance with laws and regulations: **P1** and **P4** for power generation; **H1 and H6** for heat generation and **B1 and B3** for biomass residues. Namely, two plausible combined scenarios are left after Step 1:
a) The Project not undertaken as a CDM project activity. (P1, H1,B1 or B3)
b) The generation of power in the grid; the generation of heat in boilers using fossil fuels; the biomass residues are dumped or left to decay under mainly aerobic conditions or are burnt in an uncontrolled manner without utilizing it for energy purposes. (P4, H6,B1 or B3,which is Scenario 2 in ACM0006)

STEP 2. Barrier analysis

There are no barriers identified that would prevent the implementation of either of the two alternative scenarios above. Therefore, neither of the two combined scenarios is eliminated by the step2. The two combined scenarios need to be further discussed in Step 3.

STEP 3. Investment analysis

According to the ACM0006 (Version 09), project participants shall identify the most plausible baseline scenario and demonstrate additionality using the latest approved version of the "Combined tool to identify the baseline scenario and demonstrate additionality".

However, Version 02.2 of the aforementioned tool establishes in footnote 1 (on the first page) that for project activities in which one or more alternatives are not available options to project participants (such

[27] China Electric Power Yearbook 2007
[28] Notice on Strictly Prohibiting the Illegal Installation of coal-fired Generators with the Capacity of 135MW or below issued by the General Office of the State Council, Guo Ban Fa Ming Dian decree No. 2002-6

as grid-connected power projects), a different procedure to demonstrate additionality and identify the baseline scenario must be followed. For example, methodologies that involve alternatives that is not under the control of project participants can continue to use, if desired, the additionality tool (provides benchmark and other tools that utilize information about the markets in which such projects might compete), and provide their own methods to develop and/or assess baseline scenario. Besides, "Guidance on the Assessment of Investment Analysis" issued in EB51 has clearly pointed that if the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate.

According to the above, this PDD will use the Benchmark to analyze whether the proposed project activity is less economically or financially attractive than the alternatives without the revenue from CERs. The investment analysis is conducted in the following steps:

Sub-step 3a. Apply benchmark analysis.

The project IRR benchmark for this project is 8%. This was set by the Department of Power Generation & Transmission Operations of the former State Power Corporation of China, in the "Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects"[29]. This organization was responsible for carrying out government policies relating to new and retrofit power projects and for issuing rules such as IRR benchmark. Following re-organization, the functions of the State Power Corporation were transferred to the National Development and Reform Committee.

The Interim Rules were issued based on "The Methodology and Parameters for Financial Evaluation of Construction projects (Chapter 1 General, Section 1.1)"edited by the National Development and Reform Committee and Construction Ministry. The 8% project IRR benchmark listed in the Interim Rules is still valid and is applicable to new and retrofit power projects including cogeneration power projects, and is accepted as the benchmark of CDM projects in the power sector which has been used widely for the Feasibility Studies Reports of those projects. Hence, the proposed project adopts this benchmark.

In addition, the 8% project IRR benchmark used in the PDD is an important index that is adopted in the benchmark investment analysis of Feasibility Study Report (FSR). The project FSR was approved by DRC of Hunan Province in August 2007.

Sub-step 3b. Calculation and comparison of financial indicators.

1) Key Parameters needed for calculation of IRR

According to the Feasibility Study Report (FSR) of the proposed project, key parameters needed for calculation of IRR are as follows:

Table B-5 Key Parameters for calculation of IRR

Parameter	Value	Unit	Source
Installed capacity	48	MW	FSR Vol.01 P99
Project Lifetime (operational period)	20	years	FSR Vol.03 P5
Net Power Generation output	253,440	MWh	FSR Vol.01 P99
Net Heat Generation output	1,083,204	GJ	FSR Vol.01 P99
Static total investment	438,720,000	RMB	FSR Vol.03 P4
Tariff(incl. VAT) in first 15 years	653	RMB/MWh	FSR Vol.03 P6
Tariff(incl. VAT) after the 15 years	403	RMB/MWh	FSR Vol.03 P6

[29] State Power Corporation of China. Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects. Beijing: China Electric Power Press, 2003.

Annual O&M cost(including the fuel cost)	125,567,841	RMB	FSR Vol.03 P8
Heat price(excl. VAT)	29.85	RMB/GJ	FSR Vol.03 P7
Biomass Cost	275	RMB/t	FSR Vol.03 P5
Income tax	25%		FSR Vol.03 P6
VAT for Electricity	17%		FSR Vol.03 P6
VAT for Heat	13%		FSR Vol.03 P6
Depreciation period	15	years	FSR Vol.03 P6
Residual Rate	4%		FSR Vol.03 P6
Expected CER price	8	EUR	FSR Vol.03 P7

The project owner made the investment decision based on the FSR and all the input values used in the investment analysis were taken from the FSR for the project carried out by the FSR Institute, which is certified to compile design reports for power projects with the highest grade A issued by Ministry of Construction P.R.China. In accordance to Chinese procedures, assumptions and data sources for the economic evaluation are based on relevant national standards and criteria. Furthermore, all the data in the FSR was assessed by designated independent experts and finally approved by the DRC of Hunan Province. Therefore, the values are considered to be reliable and suitable.

In addition, the rationality of the main input values is justified as follows:

Static total investment

The static total investment does not include investment on heat pipelines, since there is no agreement as yet with the industrial park whether the industrial park or the project owner should pay for it, but the heat revenues are definitely included in the IRR calculation and therefore the investment analysis is conservative. The static total investment is broken down as follows:

Civil Works	102.19million RMB
Equipment Purchasing t Fees	145.81million RMB
Equipment Installation Fees	83.42 million RMB
Other expenditure	107.30million RMB
Sub-Total	483.72million RMB

Considering that the static total investment per kW of biomass power projects in China are generally between 10,000-13,000 RMB/kW[30], the static total investment of the proposed project of 9,143RMB/kW can be considered to be appropriate.

Furthermore, it can be seen that for the 11 registered CDM projects available on the UNFCCC website at the time of writing (31/12/2008) that the average static total investment per kW is 10,360RMB/kW[31]. Please see table B-6 below.

Table B-6 Summary of the Key Parameters of the registered 11 biomass power generation projects in China

[30] http://www.newenergy.org.cn/Html/0084/4100816608.html
[31] http://cdm.unfccc.int/Projects/registered.html

Project Code	Capacity (MW)	Total Investment (Million RMB)	Annual power Generation (GWh)	Capitcal cost per MW(RMB/KW)	Operational Hours(hours)	Auxiliary Consumption Rate	Biomass Price (Yuan RMB/t)
778	24	259.42	132	10,809	NA	NA	190
811	15	121.56	71	8,104	6000	21%	NA
825	25	256.52	121	10,261	5500	12%	209
819	24	241.34	133	10,056	6500	15%	300
820	24	242.79	133	10,116	6500	15%	300
1032	25	294.18	128	11,767	6000	15%	300
1263	24	247.74	112	10,323	NA	NA	200
1293	24	269.42	124	11,226	NA	NA	150
1375	30	290.96	145	9,699	5500	12%	280
1366	25	276.09	127	11,044	5500	8%	240
1546	25	264.02	127	10,561	5500	8%	208.3
Average				10,360	5875	13.2%	238

Additionally, the proposed project started construction in 2008, which is much later than the registered projects, it is reasonable to assume that costs would have risen since the other project were constructed. Specifically inflation for the main raw materials would need to be considered in the comparison The national Pricing Indices of raw materials and power in year 2003,2004,2005,2006,2007(which are 104.8,111.4,108.3,106,104.4 respectively[32]) and the national Pricing Indices of investment in fixed assets in year 2003,2004,2005,2006,2007 (which are 102.2,105.6,101.6,101.5,103.9[33]) are representing an average increase of 3% per year both show a general increasing trend of investment cost in China prior to the investment decision.

Given that the project total investment is both consistent with industrial standards and with other projects registered with the CDM Executive Board, it is reasonable to conclude that the static total investment of the project in the FSR is justified.

O&M Costs

The O&M costs include the fuel expenditure (biomass residues cost), Material expenditure, Water expenditure, Employee expenditure, Repairs and maintenance, Insurance fee and other O&M expenditure Of these, the fuel expenditure represents 75% of the total O&M cost.

The biomass cost is estimated based on investigation on the local labour cost, collection cost, transportation cost and pre-treatment cost by the FSR writing institute and the project owner with the support from the local authorities.

The project owner does not own the biomass residues as they belong to individual farmers. The project owner procures the biomass from the agent who organizes the collection and the transportation of biomass from the field to the power plant. Therefore there are many associated costs with the procurement of biomass residue for the power plant. The project business model for biomass procurement is showed as below:

[32] Data source: China Statistical Yearbook 2004-2008; http://www.stats.gov.cn/tjsj/ndsj/2008/indexch.htm
[33] ibid

Figure B-2 Project Business Model for Biomass Procurement

The value applied in the investment analysis is a reflection of the fact that in order to get the biomass from the fields to the power plant there are associated costs with collection cost particularly agent cost for collection, transportation, handling and storage. This is clearly described in the FSR and Biomass Availability Report of the project. According to the FSR and the Biomass Availability Report, the work flow for the biomass supply chain is as shown in Figure B-3 below.

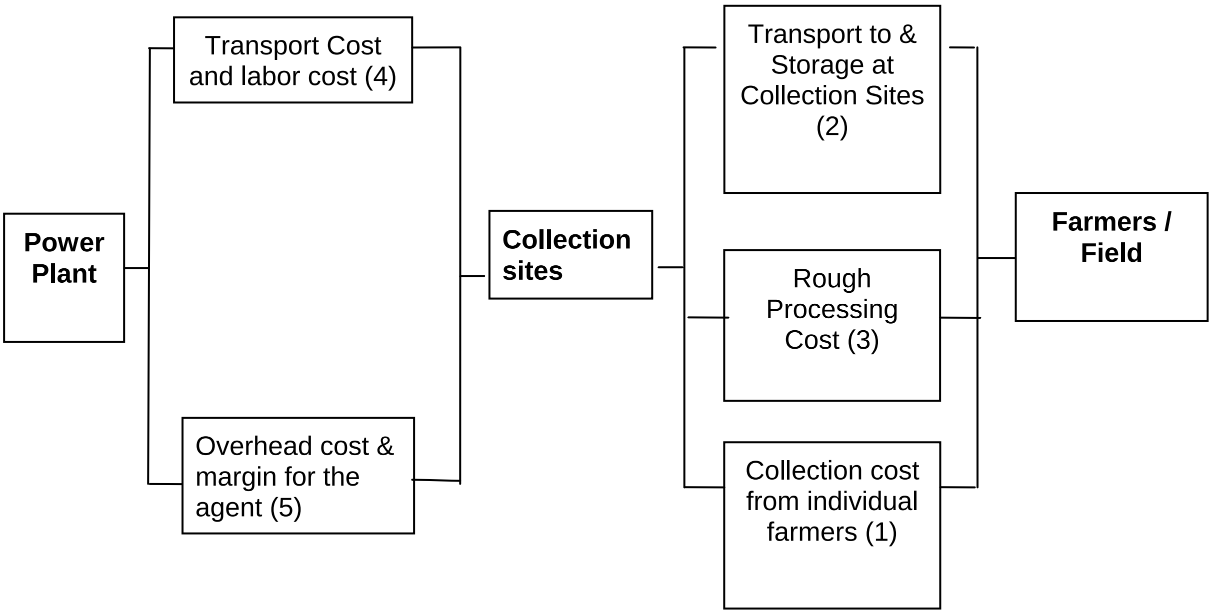

Figure B-3 Work flow for biomass collection and transportation

The above work flow clearly shows that there are costs incurred in two stages. Firstly, the cost incurred from the fields to the collection sites and then secondly, the cost incurred from the collection sites to the power plant.

The cost incurred from the fields to the collection sites includes the biomass collection cost from the individual farmers to the collection site (1), then transport to the collection sites and storage at the collection site (2) and then pre-treatment cost of biomass incurred at the collection sites (3).

The costs incurred to get the biomass from the collection sites to the power plant again include vehicles and labor (4). There will also be an overhead cost and margin associated with the third party agent that supplies the biomass from the local farmers (5).

The business model applied in the project is common practice according to the research report from the Chinese Journal, Renewable Energy Resources[34] which also illustrates the same work flow for collection, transportation, handling and storage, agent's overhead and margin as the project activity.

Breakdown of Biomass Costs for the proposed project

The breakdown of the biomass cost (delivered to the plant) for the proposed project has been estimated and provided by the FSR design institute[35] and this breakdown is as follows (in accordance with the work flow in Figure B-3 above):

i. ***Cost from farmers/field to the collection site (1+2): 125RMB/ton***, including the collection cost at the field (labor cost) and transportation cost from field to the collection sites and storage.
ii. ***Cost incurred at the collection site (3+5): 70RMB/ton,*** including the land utilization cost, pre treatment cost, labor cost, biomass residues loss, agent margin/agent cost
iii. ***Cost from the collection site to the power plant for power generation (4): 80RMB/ton,*** including the transportation cost, the labor cost (loading and unloading), and the biomass loss.

The total purchase cost of 275RMB/tonne in the IRR calculation is derived from the cost breakdown above and therefore does not represent a market value. The cost breakdown does include a margin for the agent to undertake the role as intermediary, but this is considered to be reasonable given the costs that the agent incurs.

It is reported that the typical biomass cost in the CCPG area where the project located was 300RMB/ton in 2006[36], whereas, the project assumes 275RMB/ton.
Additionally, it can be found that for the 11 registered CDM projects available on the UNFCCC website at the time of writing (31/12/2008) that the average static biomass cost in China is 238RMB/t(please see Table B-6 above) which is very similar to the biomass cost of the proposed project (241RMB/t).

Therefore, the biomass cost in the FSR should be considered to be appropriate and conservative.

Power and Heat Generation:

The Net Power Generation of the project in the FSR is calculated as follows:

Net Power Generation
=Installed Capacity x Equivalent Operational Hours at full load x (1-auxiliary consumption rate)
=48MW x 6000h x （1-12%）
=253,440MWh

Installed Capacity[37]

The rated installed capacity of the steam turbines is 4 x 12MW. The rated steam extraction of the proposed project is 4 x 15t/h, with power generation capacity of 4 x 12MW. The power output, heat output and IRR calculation in the FSR is based on this operational condition.

[34] The operating model, existing problems and development strategies for China's straw storage and transportation system, Renewable Energy Resources,Vol.27 No.1,Feb. 2009

[35] Clarification on the biomass cost assumption in the FSR, KaiDiGongChengHan[2009]013, February 8th,2009

[36] Related Questions Research on Biomass Generation Using Agriculture and Forest Residue in China, HUANG Jintao, Journal of Shenyang Institute of Engineering (Natural Science), Vol14 No11,Jan. 2008

[37] Technical specification of the steam turbine

Under conditions where there is no steam extraction the steam turbines can theoretically generate at 4 x 15MW. This situation would be applicable to a scenario where there is no heat generation. However, as described above the intention of the project is to generate power and provide heat to the industrial park.

Nonetheless, in order to demonstrate the continued additionality if the project were to generate power at 15MW, a separate investment analysis has been completed. It shows an IRR of 4.25%, which is both below benchmark and below the IRR when a capacity of 4 x 12MW power generation and rated heat generation is assumed[38]. The reason why the IRR is lower than the rated scenario is because the efficiency of the plant is higher when operating in cogeneration mode[39].

The opposite extreme scenario would be applicable to a scenario when the maximum stream is extracted. The IRR of this scenario is 7.17%[40], which is still far below the benchmark and higher than the rated scenario. The reason the IRR is higher than the rated scenario is because the fixed tariff of electricity by the government is not financially attractive than the heat price assumed in the FSR. The table below shows that the key elements in the three operational conditions:

Operational Conditons	**Power Capacity**	**Steam Extracted**	**Annual Revenue in the first 15 years**	**Annual Revenue in the last 5 years**	**IRR**
Rated Scenario	4 x 12MW	4 x 15t/h	173.67 million RMB	119.52 million RMB	4.83%
Condensing Scenario	4 x 15MW	0t/h	176.68 million RMB	108.98 million RMB	4.25%
Maximum Extraction Scenario	4 x 6.59MW	2 x 45t/h	174.62 million RMB	144.88 million RMB	7.17%

From above, we can conclude that the different operational conditions of the project will not change the additionality status of the project.

Equivalent Operational Hours at full Load

The investment analysis assumes 6000 hours as the equivalent operational hours at full load. It does not assume that the plant will only operate for 6000 hours, but rather that the project will not run at full capacity for 100% of the time.

The following bullet points provide a technical explanation of the 6000 operational hours[41].

- Risk on the Reliability of the CFB boiler
  The CFB boiler is designed by the project owner and manufactured by domestic manufacturer. All the facilities in fuel feeding system are also domestic equipments. Although Wuhan Kaidi Power Engineer Co. Ltd has done a lot of research on the CFB biomass fired boiler, this new technology still needs to be tested and debugged during a long-term operation, and there's still relatively great potential technology risks, like inadequate steam output, dust depositing, unbalanced fluidization, serious corrosion of heating surfaces etc.

- Risk on the fuel quality

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[38] IRR spreadsheet when no steam is extracted from the steam turbines
[39] http://www.newenergy.org.cn/html/0079/200796_14310_1.html
[40] IRR spreadsheet when maximum steam is extracted from the steam turbines
[41] Introduction on the operational hour 's calculation and assumption for Kaidi Biomass Power projects

The biomass contains considerable elements of K, Na, and Cl, resulting in a high risk of dust depositing, blockages and erosion. Moreover, the content of SiO_2 in rice husk ash is higher than 85%, which will cause serious wear and tear of heating surface. Although some mitigation measures are taken, potential risks still exist. Besides, biomass residues are seasonal fuels, not only the amount but also some characteristics (such as water content) always fluctuate seasonally. Additionally, the residues may rot during storage and the calorific value will decrease. Any changes in the quantity and quality of biomass could lower the generator operating hour, or even stop production.

- Maintenance
  The technology is relatively new to the project owner. Having no experience in operation and maintenance and thus no skilled workers will affect the efficiency and smooth operation of the plant. Also, because the feeding system of biomass power plants is much more complicated than that of normal coal-fired power plants, there is a number of resulting technology difficulties. Until now, nearly all relevant equipment in the operating biomass power plants in China are imported. However, all the devices of feeding system employed in this project are domestically manufactured. Considering that there's no mature Industrial and market of supporting devices and service, a higher frequency of incidents that require maintenance as well as longer maintenance periods would be expected.

In addition to the explanations above, the project owner has made a comparison of similar biomass projects in operation[42]. Zhongjieneng Suqian Biomass project is considered as a comparable project since it is a publicly available grid connected biomass residues project using CFB boilers and it is located in the southern area of China. The monitoring reports of this project covering almost 1.5 years shows that its operational hours are considerably less than 6000 hours[43].

Table B-7 Actual operational Hour for Similar project-Zhongjieneng Suqian Biomass Power Plant

[42] http://www.ccchina.gov.cn/WebSite/CCChina/UpFile/2008/20081211111144663.pdf
http://www.sdpc.gov.cn/jggl/zcfg/W020080407569102971887.pdf
[43] http://cdm.unfccc.int/UserManagement/FileStorage/5F9OE9FXXPZN54ANH8ERHI56PZNR8A
http://cdm.unfccc.int/UserManagement/FileStorage/OF2X17HG0DRAQMV8IZS9BL6YN4ETJW

Monitoring period	Exported Power from the two monitoring reports	Power Generated(Assuming 12% is the self consumption rate)
Apr-07	710	807
May-07	3290	3739
Jun-07	3800	4318
Jul-07	1960	2227
Aug-07	4250	4830
Sep-07	5240	5955
Oct-07	7410	8420
Nov-07	12930	14693
Dec-07	11440	13000
Jan-08	6570	7466
Feb-08	9110	10352
Mar-08	13490	15330
Apr-08	13640	15500
May-08	13950	15852
Jun-08	6200	7045
Jul-08	5530	6284
Total Electricity Generated		135818
Operational hour from April 2007 to July 2008		4244
Operational hour from July 2007 to July 2008		5197

Also by way of comparison, looking at the 11 registered CDM projects in China available on the UNFCCC website at the time of writing (31/12/2008), it can be seen that the operational hours at full load used by these projects is between 5500h and 6500h(See Table B-6 above) and therefore 6000 can be considered to be reasonable.

Heat Generation

The rated steam generation of the project is 60t/h with a temperature of 296.5℃ a pressure of 1.27Mpa, thus an enthalpy of 3.0089GJ/t. Therefore, the Heat Generation in the FSR is calculated as follows:

Heat Generation=60t/h x 6000h x 3.0089 GJ/t=1,083,204 GJ

Auxiliary consumption rate

The auxiliary consumption rate of the project plant in the FSR is assumed as 12%.

The in house loads of the project (including both the high voltage facilities and low voltage facilities) are totally 4995.2KW[44], based on which, the calculated auxiliary consumption rate of the power plant is 16.6%[45], higher than 12%, which shows that the 12% used in the IRR calculation is conservative.

Besides, the average auxiliary consumption rate is 13.2% for the registered biomass power plants in China (See Table B.6 above). Therefore, the auxiliary consumption rate for the project is reasonable.

Power tariff

[44] Log books of the in-house load facilities, referred by the purchase contracts, provided by the project owner; For now, the project is only equipped with facilities for 24MW capacity.

[45] Power Industrial Standards of People's republic of China, Technical Rule for Designing auxiliary power system of fossil fuel power plant issued in year 2002; Standard Code: DL/T 5153-2002

Calculation of the auxiliary rate spreadsheet

According to (*Renewable Energy Electricity Tariff and Cost Management Trial Regulations (fagaijiage [2006] 7)* issued by NDRC of China in 2006, for biomass power plant, the tariff within the first 15 years since commissioning is calculated by 0.25RMB/KWh plus the benchmark for the on-grid tariff of coal-fired power plants with de-sulphurisation units installed in year 2005. After 15 years' operation, the tariff would be cancelled.

The tariff of 0.653RMB/KWh including VAT used in the investment analysis is consistent with the FSR. This tariff used in the FSR was estimated by taking the basic tariff rate for de-sulphurisation coal fired generator units in year 2006&2007 in Hunan province and applying the subsidy of 0.25RMB/kwh for first 15 years. In year 2006&2007, the basic tariff rate for de-sulphurisation coal fired generator units in Hunan province is 0.403RMB/KWh including VAT[46]. The tariff 0.403RMB/KWh including VAT is used after 15 years' operation.

The approved FSR of the project was finalized in November 2007.The FSR uses the most recent tariff for on-grid coal-fired power plants with de-sulphurisation units installed in Hubei province available at that time.

The tariff approved by the Pricing Bureau of Hunan province for the project is 0.634RMB/KWh (0.384 RMB/KWh as the basic tariff rate for de-sulphurisation coal fired generator units in year 2005 in Hunan province +0.250 RMB/KWh as the subsidy) for the first 15 years and without the 0.250RMB/KWh subsidy after the 15 years[47]. This is the actual tariff obtained by the project, which is consistent with the regulation and lower than the one estimated in the FSR.

Thus, the tariff used in the investment analysis is conservative.

<u>Heat price</u>

The heat price in the FSR is 29.85 RMB/GJ excluding VAT, which is determined after a investigation of the heat demand, local market price of heat supply during the FSR period and a fully discussion with the Administration Bureau of Industrial Park by the FSR writing Institute and the project owner.

This price is the price at the generation site and does not include the pipeline cost and the transmission losses. The heat pipeline capital cost is borne by the local government.

In order to provide additional substantiation as to the heat price applied in the investment analysis, a levelized cost analysis for the independent small coal fired boiler heat generation has been done to illustrate whether or not it is feasible to purchase heat from the proposed project from the heat users' point of view. If the purchase price of heat is higher than the levelised cost of generation heat, the existing heat users will continue to run their own small coal-fired boilers to meet their heat demand.

The levelised cost was calculated based on 6 t/h coal-fired boilers as these are common practice boilers for heat generation in China[48] . The key assumptions are described below.

i Capital cost

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[46] http://www.gov.cn/gzdt/2006-07/01/content_325205.htm
http://www.ndrc.gov.cn/zcfb/zcfbtz/2008tongzhi/t20080702_222227.htm

[47] The tariff approval of Yueyang Kaidi Biomass Power Generation Project, Pricing Bureau of Hunan Province, XiangJiaHan[2009]149, February 31th, 2009

[48] FANLing, CAO Qin, GUTao, YUQian, Comparison of Environmental Impact and Operation Cost of Mini Type Gas-fired Boiler(Oil-fired Boiler) with Coal-fired boilers,[J] Arid Environmental Monitoring, 2004(03)

The capital cost of 665,000 RMB used in the levelised cost is an average capital cost of a 6t/h coal-fired boiler which is from publicly available reference[49] and is therefore deemed reliable and credible.

ii Coal cost (Fuel cost)

- Coal consumption: 7,387 tonne/year

The coal consumption is calculated by considering the boiler efficiency, and heat value of purchased coal, heat generation, heat enthalpy of the rated steam from the boiler. This is taken from publicly available data which are listed in the table below. Therefore the input value is appropriate for the levelised cost calculation. The audit team has recalculated the coal consumption by using the same data input.

- Coal price: 550RMB/tonne was based on the published market price in 2009 and the reference can be seen in the table below.

iii. O&M cost (excluding fuel cost)

For a typical 6 t/h coal-fired boiler, annual O&M cost is 422,625RMB (excluding fuel cost) which includes desulfurization expenditure, electricity consumption cost, labor cost, overhaul, ash and sediments treatment fees etc. Each component of O&M cost was rated in terms of the relevant sector standard and published market rate. Each component of O&M was justified as below:

- Labor cost: 140,000 RMB
  - Employee number: 7 people
  - Salary: 20,000RMB/employee/year

- Overhaul cost: 2.5% of capital cost

The overhaul cost is calculated by 1.5% to 5% of fixed assets investment[50].

- Ash and sediments treatment fees: 50,000 RMB/year[51]
- Desulfurization expenditure:72,000 RMB/year[52]
- Electricity cost:140,000RMB/year[53]

The input parameters and reference were listed in the table below. Furthermore, the levelised cost spreadsheet was provided and the correctness of the calculations has been checked.

Table B-8 Input parameter for levelised cost and reference table

Parameter	Value	Unit	Reference
Construction period	1	year	Experienced data

[49] FANLing, CAO Qin, GUTao, YUQian, Comparison of Environmental Impact and Operation Cost of Mini Type Gas-fired Boiler(Oil-fired Boiler) with Coal-fired boilers,[J] Arid Environmental Monitoring, 2004(03)

[50] Financial evaluation and difficult question analysis for FSR research and bank loan project, Chen Pucai, China Planning Publishing Company, 2007

[51] WU Xihuan. Inner Mongolia Oil and Chemistry, Investigation on retrofitting the coal-fired boiler to gas-fired boiler, 2008 (10)

[52] WU Xihuan. Inner Mongolia Oil and Chemistry, Investigation on retrofitting the coal-fired boiler to gas-fired boiler, 2008 (10)

[53] WU Xihuan. Inner Mongolia Oil and Chemistry, Investigation on retrofitting the coal-fired boiler to gas-fired boiler, 2008 (10)

Lifetime	25	years	"Introduction on the lifetime of the boilers" by the Senior Engineer Zhu yuqing from Central Southern China Electric Power Design Institute of China Power Engineering Consulting Group
Boiler efficiency	85%		AM0058, Page26
Capacity	6	t/h	Taking it as example for the calculation
Capital Cost	665,000	RMB	FANLing, CAO Qin, GUTao, YUQian, Comparison of Environmental Impact and Operation Cost of Mini Type Gas-fired Boiler(Oil-fired Boiler) with Coal-fired boilers,[J] Arid Environmental Monitoring, 2004(03);
Coal Price	550	RMB/ tonne	http://news.stockstar.com/info/darticle.aspx?id=JL,20090707,00001411&columnid=2921
Heat Value of the Coal	5,500	Kcal/tonne	Ibid
Unit conversion from Kcal to KJ	4.182		
Operational Hour	8,000	hours	Information obtained from the owners of the existing mini type coal-fired boilers
Assumed enthalpy of the rated Steam from the boiler	3,009	KJ/kg	Same data from the biomass fired boiler in the proposed project
Discount Rate -(r)	0.08		Benchmark used in power industry
Labor Number	7		WU Xihuan. Inner Mongolia Oil and Chemistry, Investigation on retrofitting the coal-fired boiler to gas-fired boiler, 2008(10)
Salary of the labor	20,000	RMB/year	Information obtained from the owners of the existing mini type coal-fired boilers
Electricity Cost	144,000	RMB	WU Xihuan. Inner Mongolia Oil and Chemistry, Investigation on retrofitting the coal-fired boiler to gas-fired boiler, 2008(10)
Desulferisation Cost	50,000	RMB	Ibid
Ash and sediments treatment fees	72,000	RMB	Ibid
Employee Cost	140,000	RMB	Calculated

Overhaul	16,625	RMB	Calculated using the experienced overhaul rate as 2.5% and cross checked with the Chinese standard of overhaul rate range[54]
Coal consumption	7,387	tonne	Calculated
Fuel Cost	4,062,993	RMB	Calculated
Total heat generation	144,427	GJ	Calculated
O&M Cost excluding the fuel cost	422,625	RMB	Calculated

The levelized cost of a coal fired boiler for the heat user to supply heat to themselves independently is 31.5RMB/GJ[55]. This demonstrates that the heat price for the project activity of 29.85RMB/GJ is reasonable.

The heat price is confirmed by an official document which was issued by the Industry Economic Bureau of Quyuan Management District issued on March 31th, 2010[56], the heat selling price for the Yueyang Kaidi biomass power project should not be higher than 30RMB/GJ (excluding VAT) in consideration of the consumer's procurement cost of heat.

Income Tax

The EB51 Annex 58 –Guidance on the assessment of investment analysis (Version 03) indicates that*" In cases where a post-tax benchmark is applied the DOE shall ensure that actual interest payable is taken into account in the calculation of income tax. In such situations interest should be calculated according to the prevailing commercial interest rates in the region, preferably by assessing the cost of other debt recently acquired by the project developer and by applying a debt-equity ratio used by the project developer for investments taken in the previous three years."*

The benchmark used or the proposed project is a post-tax benchmark. Therefore, according to the guidance mentioned above, the income tax after interest is used for IRR calculation for the proposed project.

The interest rate, pay back period and debt ratio are taken from the FSR and applied in the IRR calculation.

No ash revenue is predicted

✧ *The ash revenue is not considered in the financial analysis in the FSR*

According to the FSR, there is expected to be 18.9 thousand ton ash per year generated by the project.

According to the EIA report, the ash is considered as solid residues which will lead to field occupation and pollutions to the soil and air, thus needs to be treated or utilized.

[54] Financial evaluation and difficult question analysis for FSR research and bank loan project, Chen Pucai, China Planning Publishing Company, 2007

[55] Spreadsheet of the Levelized cost of a new coal fired boiler to supply heat to the heat users itself, provided to the auditor

[56] Clarifications on taking Yueyang Kaidi Biomass Power Generation Project as the district heating system in Quyuan Management District, QuGongJingHan [2010] 3

Although the ash is considered as a solid residues generated from the project, it could be utilized as fertilizer for the local farmers to improve the soil condition because it contains nutrient elements as K and P elements.

However, considering that the fuels utilized in the project is a mixed of biomass residues, the effective component in the ash would be low and not homogenous in nature. The ash is also alkali which means it is only good for the acidic soil, thus the local farmers are not interested in purchasing the ash as fertilizer at all.

Therefore, the project is designed not to build storeroom (there will be a temporary space) for the ash but to ask some local fertilizer company to transport it outside of the power plant and deal it on it's own expense with no transaction between the two parties. Through this, the field occupied in the project site by the ash is saved and the project owner will realize the utilization of the ash required by the EIA report.

Therefore, there is no revenue from ash for the project and the there is no ash revenue in the IRR calculation in the FSR.

✧ *There is no market for the ash based on experience from other operational biomass power plants*

The experience from the already commissioned biomass projects which belong to the project owner's parent company shows that the ash is in fact a "cost" instead of a "revenue". Due to the EIA requirements as mentioned above, those projects have had to pay the local farmers to transport the ash outside of the power plant. The local farmers may bring it to the refuse dump or use it as additive to the construction material. Therefore, it is reasonable to predict that no revenue will be obtained from ash, but rather additional expenditure will be required.

However, to be conservative and to demonstrate that the ash revenue (if any) will not influence the additionality of the project, the ash price at which the revenues would bring the IRR over the benchmark has been calculated. The results show that the ash price should be higher than 263RMB/ton[57] to increase the IRR to 8%. Given that the market price for cement is only around 300RMB/ton in China at the time of investment decision of the project[58], 263RMB for waste ash is not plausible and as such ash revenues cannot impact the additionality of this project.

2) Comparison of the project IRR and the financial benchmark

In the IRR calculation, the fixed input values were used by the project owner for the electricity tariff and O&M costs for the whole operation period. This is required by the national criteria. According to "Methods and Parameters" which is the national guidance for evaluation of new investments and is also the guidance for Design Institute to conduct the FSR[59], the tariff rates for both output and input values should be predicted at the beginning of the operation period and that these predictable tariff rates will be fixed and applied throughout the operation period. This is due to the fact that the operation period is long and it is difficult to predict the inflation rate and the outcome of that rate[60].

Furthermore, the tariff rates at the beginning of the project for both electricity and O&M also represent the rates which project owner can obtain and ensure to use for the investment analysis at the time of

[57] IRR spreadsheet , it is provided to the Auditor.
[58] http://www.m188.com/newsinfo/2008-1-4/200814-1627355472.html
[59] P84 Method and Parameters (Version 3), published by the NDRC and the Ministry of Construction of China, 2006
[60] P84 Method and Parameters (Version 3)

decision-making in the project. Accordingly, the decision to go ahead with the project is based on the assumptions of fixed O&M and electricity tariff rates.

Also in China, the electricity tariff is controlled by China government and it is hard for project owner to forecast the future electricity tariff rate and inflate rate for the O&M cost. The electricity tariff is related tightly to the national economy. The Government will only raise tariffs when it is absolutely necessary and therefore when the costs of power production have increased sufficiently to justify an increase. The power tariff is increased only due to the rise in operation costs (such as coal price, labour, transportation and interest rates) of the power generators. Because of fears that it could further drive up inflation and as a developing country it is important to keep prices down to ensure affordability across society[61]

Moreover, the published sector benchmark is based on the assumption of application of fixed input value. Compared to such a benchmark, the same assumption in the IRR calculation should be applied.

As such fixed input values were applied by the project owner for the electricity tariff and O&M costs. These were applied in the calculation of the IRR over the whole operation period in FSR by the Design Institute. Accordingly, these fixed input values from FSR were applied in IRR calculation. Any change in the electricity tariff is uncertain and this is dealt with by analysis of the IRR in the sensitivity analysis, where the robustness and the likelihood of the project exceeding the benchmark is dealt with.

TableB-9 shows the project IRR with and without the income from CERs sale. Without the sales of CERs, the project IRR is 4.83% which is lower than the financial benchmark. Thus the proposed project is not financially acceptable. Taking into account the CDM revenues, the project IRR is 12.34% and higher than the financial benchmark. Therefore, the CDM revenues enable the project to overcome the investment barriers.

Table B-9 Comparison of Project IRR with and without the income from CERs sale

Item	Without CDM	Benchmark	With CDM
Project IRR	4.83%	8%	12.34%

Sub-step 2d. Sensitivity analysis

For the proposed project, six parameters were selected as sensitive factors to assess the financial attractiveness:

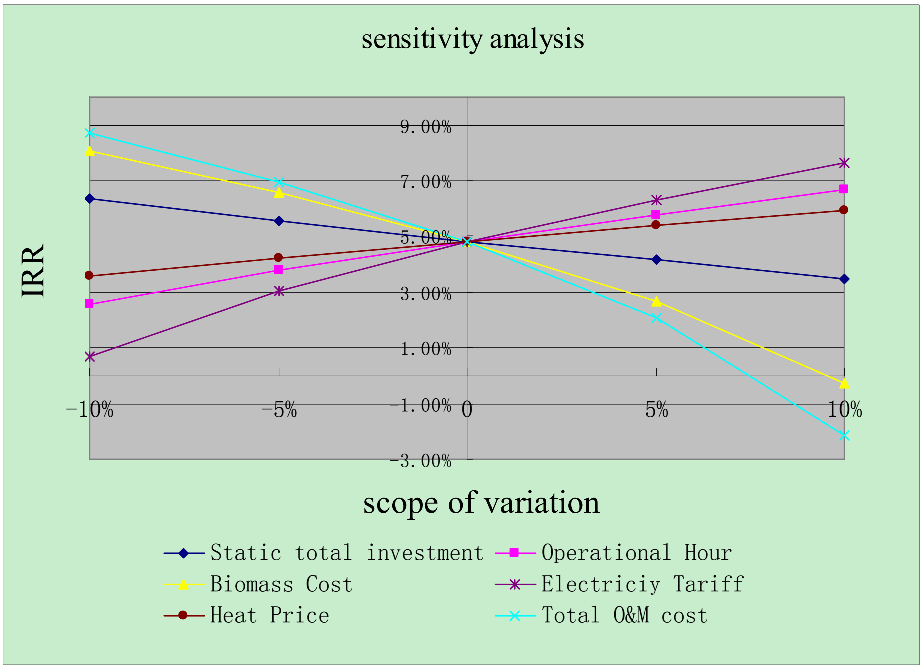
1) Static total investment
2) Equivalent operation hour at full load
3) Electricity tariff
4) Heat Price
5) Biomass Cost
6) Total O&M Cost

Assuming the above six factors vary in the range of -10% to 10%, the project IRR (without the income from CERs sales) varies to different extents as shown in Table B-10 and Figure B-4 below.

TableB-10 Sensitivity analysis of the proposed project

[61] http://www.ndrc.gov.cn/xwfb/t20050628_27624.htm

	-10%	-5%	0	5%	10%
Static total investment	6.38%	5.58%	4.83%	4.14%	3.50%
Operational Hour	2.56%	3.82%	4.83%	5.78%	6.69%
Biomass Cost	8.06%	6.56%	4.83%	2.68%	-0.29%
Electriciy Tariff	0.68%	3.05%	4.83%	6.32%	7.64%
Heat Price	3.59%	4.24%	4.83%	5.40%	5.95%
Total O&M cost	8.69%	6.93%	4.83%	2.06%	-2.15%



FigureB-2 Sensitivity analysis of the proposed project

When the Static total investment, Equivalent Operational Hour at full load , Tariff, Heat Price are changing within the range of -10% to 10%, , the IRR of the proposed project is always lower than the investment benchmark, and lacking of financial attractiveness. Only when the total O&M cost decreased by 8% or the biomass cost decreased by 10%, the IRR would reach 8%. However, it is not possible for the biomass cost to decrease, and certainly not by 10%. The following text gives further discussion on the sensitivity of the input values.

Biomass Cost

It can be seen that the total O&M Cost is the most sensitive indicator. When it was decreased by 8%, the IRR would reach 8%. Of the total O&M Cost, biomass cost account for 81%, when the biomass cost dropped by 10%, the IRR will reach 8%. However, it is not possible for the biomass cost to decrease, and certainly not by 10%. This is because the biomass purchase price is determined based on actual costs for collection, transportation, and mechanical pretreatment. From 2002 to 2006, the general pricing index of the Hunan Labor cost, the transportation cost, the fuel and power cost are listed as follows[62]:

[62] http://www.stats.gov.cn/tjsj/ndsj/

	2002	2003	2004	2005	2006
Average Wages Index	114	111.4	114	112.4	114
Transportation Cost for Consumer Price Indices	98	100.5	101.4	101.3	104.6
Raw material, Fuel, Power Purchasing Index	99.3	106.7	114.4	109.4	106.5

This table clearly shows an upward trend over last five years. Therefore the biomass price is not likely to decrease.

Besides, the experience from the other early biomass projects in China shows that when the farmers realize the biomass residues could be a product, they would start to bargain fiercely and even when there is a surplus in supply it has been shown that the price will increase dramatically.

For example, the first biomass co-firing project in China, Shiliquan Biomass co-firing power plant, which was put into commission on December 2005 in Shandong Province, assumed a biomass cost of 100RMB per tonne was assumed in the FSR. After commissioning, the price rose to 400RMB[63].

What is more, the purchase statements as well as the settlement log book shows that rice husks were between 290RMB/t and 305 RMB/t (delivered price to plant) in February 2010[64], which confirms that the increasing trend rather than decreasing trend of the biomass cost.

Power Tariff

When the power tariff is increased by 11%, the IRR reaches the benchmark. This is not possible because in China, the tariff is strictly regulated by the Chinese Government and it is established according to strict regulations rather than by a market mechanism. Also at no point in history has the tariff changed so dramatically[65]. The tariff only changes when the costs of power production have increased sufficiently to justify an increase so as to limit inflation. The power tariff is therefore only increased by Government due to a rise in operation costs (such as coal price, labour, transportation and interest rates) of the power generators.

Additionally, according to < Tentative Management Measures for Pricing and Expense-sharing for Electricity Generated from Renewable Energy>, from year 2010, the subsidy for the newly approved biomass power projects in any given year will be reduced by 2% compared to the subsidy for the projects approved in the previous year. Therefore, there is very likely a decreasing trend on subsidy in the coming years for the biomass power projects in China.

Total Investment Cost

When the static total investment was reduced by 19%, the IRR would reach the benchmark. However, this is not a possible situation, given that in year 2003, 2004, 2005,, 2006 and 2007,the national pricing index of purchasing prices of raw materials, fuels and power are 104.8, 111.4, 108.3, 106,104.4 respectively. Also in 2003, 2004, 2005, 2006 and 2007 the national total price index of investment in fixed assets are 102.2, 105.6, 101.6, 101.5, 103.9 respectively[66]. There is clearly an increasing trend on investment costs.

Operational Hours

[63] http://www.sdpc.gov.cn/zdxm/t20051229_55135.htm

[64] Statement Bills and log books of the fuel purchasing of Yueyang Kaidi biomass power generation project in from 01/02/2010 to 25/02/2010

[65] http://www.stats.gov.cn/tjsj/ndsj/

[66] China Statistic Year Book, 2004, 2005,2006,2007,2008

When the operational hours at full load was increased by 17%, reaching almost 7,020 hours, then the IRR would reach the benchmark. However, based on the specific conditions of the proposed project,, considering the technical risk of the domestic biomass fired boiler, the biomass transmission system risk, biomass characteristics risk and the real operation conditions from the similar biomass power plant that are in operation, which have been mentioned above, it is practically impossible to happen[67]

Heat Price

When the heat price was increased by 31% and reaching 39RMB/GJ (excluding VAT), the IRR would reach benchmark. This is not possible.

It is a fact that for most of the cogeneration plants in China, the heat selling price is regulated by the local government. Generally, the profit rate for selling heat cannot be greater than 5% of the cost of producing the heat. [68] This is because heat is a basic service to people and Industrial and therefore the government of China regulates the price very closely to avoid inflation of the heat price which would be damaging to Chinese society.

In summary, the project would be lacking financial attractiveness without CER revenues.

Outcome of Step 3:

Based on the Investment Analysis above, the proposed project is not financially attractive without consideration of CERs sales revenues. The Combined Scenario a) "the proposed project not undertaken without being registered as a CDM project activity "is not feasible thus is eliminated.

So, the baseline scenario combination of the proposed project is Combined Scenario b) (which belongs to Scenario 2 in the methodology).

Scenario	Power generation	Heat generation	Use of biomass residues
2	P4	H6	B1 or B3

STEP 4. Common practice analysis

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

CCPG is selected as the relevant geographical boundary of the project activity, which covers Henan Province, Hubei Province, Hunan Province, Jianxi Province, Sichuan Province and Chongqiong City and includes more than 10 biomass residues power plants that are implemented or underway.

In China, the investment environment for each region is different. Specifically in terms of available resources, labour costs and electricity tariffs, these can vary significantly in different parts of China, even different province of China. Please see the table below including some typical indicators in different province of China in 2006, which shows that there is significant difference among different regions in China. Therefore, it is not appropriate to consider activities in the whole of China and CCPG is selected as the appropriate geographical scope for the common practice analysis.

[67] Introduction on the operational hour 's calculation and assumption for Kaidi Biomass Power projects

[68] http://www.chinapower.com.cn/articleattachment/1000/art1029355.pdf

Power Grid	Province	Average Wage(Yuan/ year)[69]	Sales Price of electricity(RMB/ MWh)[70]	Trasimission and Distribution Price(RMB/MWh)[71]	Water Prices (RMB/t) [72]
North China Power Grid	Beijing	40117	525.32	156.18	2.8
	Tianjin	28682	525.32	156.18	3.4
	Shanxi	18300	408.63	123.47	2.1
	Hebei	18469	440.92	95.28	2
	Shandong	19228	478.48	90.59	N/A
	Inner Mongolia	18469	352.61	97.68	1.95
East China Power Grid	Shanghai	41188	649.6	196.76	1.03
	Zhejiang	27820	569.28	111.52	N/A
	Jiangsu	23782	590.13	160.75	N/A
	Anhui	17949	503.37	126.54	N/A
	Fujian	19318	490.13	113.65	1.3
Center China Power Grid	Hubei	16048	516.75	154.25	N/A
	Henan	16981	429.24	82.7	1.6
	Hunan	17850	496.41	149.6	1.02
	Jiangxi	15590	506.82	126.29	N/A
	Sichuan	17852	465.76	147.08	1.35
	Chongqing	19215	507.04	173.8	2.1
Northwest Power Grid	Shaanxi	16918	420.74	123.8	N/A
	Gansu	17246	356.65	129.22	0.9
	Qinghai	22679	291.43	108.75	1.3
	Ningxia	21239	358.72	130.83	1.15
	Xinjiang	17819	417.13	193.58	1.36
Northeast Power Grid	Heilongjiang	16505	482.22	160.78	N/A
	Jinlin	16583	485.62	136.24	2.5
	Liaoning	19624	508.55	151.05	1.6
South Power Grid	Guangdong	26186	681.9	180.93	N/A
	Guangxi	18064	449.7	111.57	N/A
	Yunan	18711	392.33	140.36	2.05
	Guizhou	16815	377.29	95.01	1.32
	Tibet	31518	N/A	N/A	0.6
Hainan Power Grid	Hainan	15890	615.23	215.44	1.06
	Mean	21053	476.44	138.00	1.64
	Max	41188	681.90	215.44	3.40

[69] http://www.stats.gov.cn/tjsj/ndsj/2007/indexch.htm
[70] http://www.sdpc.gov.cn/zjgx/t20070716_148654.htm
[71] ibid
[72] http://price.h2o-china.com

	Min	15590	291.43	82.70	0.60
	STDEV	6570	89.82	33.37	0.69

The biomass combustion power generation Industrial in China is quite new. Until 2006, no grid-connected biomass combustion power generation or cogeneration project with similar installed capacity (15-100MW) as the proposed project has been developed in China [73] and the first similar biomass combustion generation power plant in China is the Shandong Shanxian Biomass Power Plant Project which was registered as CDM projects in year 2007[74].

Below are the similar and operational projects in the CCPG[75]: This list represents the full list of projects operational at the time of the investment decision and may be considered to be complete since it has been obtained by the NDRC.

Table B-11 Similar Project Activity in operation

Project	Capacity	Comment
Henan Luyi 25MW biomass cogeneration project	25MW	Registered as a CDM project[76]
Henan Xun county biomass cogeneration project	25MW	Applying for CDM registration[77]
Henan Changyuan 36MW biomass power generation project	36MW	Applying for CDM registration[78]
Henan Fugou biomass power generation project	20MW	Applying for CDM registration[79]
Xuchang Changge Hengguang Cogeneration Project	15MW	Applying for CDM registration[80]

Below are the similar projects that are currently under construction, but not operational. These projects have been found through internet searches as well as checking the UNFCCC and China DNA website.

Table B-12 Similar Projects in CCPG under construction

Project	Capacity	Comment
Henan Puyang 24MW biomass direct burning power generation project	24MW	Applying for CDM registration[81]

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73 http://energy.people.com.cn/GB/71890/5116814.html
74 http://cdm.unfccc.int/Projects/DB/TUEV-SUED1175012571.81/view
75 Subsidies for Renewable Project commissioned between January and September 2007 issued by NDRC and SERC: http://www.ccchina.gov.cn/WebSite/CCChina/UpFile/2008/20081211111144663.pdf
Subsidies for Renewable Project commissioned between October2007 and June 2008 issued by NDRC and SERC:
http://www.sdpc.gov.cn/jggl/zcfg/W020080407569102971887.pdf
76 http://cdm.unfccc.int/Projects/Validation/DB/GQ2NUQA6LMC3MRC76ESSETBPSFTH50/view.html
77 http://cdm.unfccc.int/Projects/Validation/DB/E7AWX2BGFNL02N1MNPSMVEEZAFJE9O/view.html
78 http://cdm.unfccc.int/Projects/Validation/DB/19GNBOAW3BNBAM4BIW2WIJ8B7CVYI2/view.html
79 http://cdm.ccchina.gov.cn/website/CDM/pdf/Item_new/Item_new4419.pdf
80 http://cdm.unfccc.int/UserManagement/FileStorage/JP7W6GI42CUX0KERQ58ZTYHNOF1LDV
81 http://cdm.unfccc.int/Projects/Validation/DB/RKAXQG6LHX64CBV4PVDZJ7AB4P6F17/view.html

Henan Xinxiang 24MW Bio-based Cogeneration Project	15MW	Applying for CDM registration[82]
Hunan Juntai biomass power generation project	70MW	Applying for CDM registration[83]
Hunan Lixian 15MW Biomass Direct Burning Power Plant Project	15MW	Applying for CDM registration[84]
Jianli kaidi biomass power project	48MW	Applying for CDM registration[85]
Hunan Yiyang Kaidi Biomass power project	48MW	Applying for CDM registration[86]
Hunan Qidong Kaidi Biomass power project	48MW	Applying for CDM registration[87]
Hubei Yicheng biomass cogeneration project	24MW	Applying for CDM registration[88]
Qichun Kaidi biomass power project	24MW	Applying for CDM registration[89]
Poyang Kaidi biomass power project	24MW	Applying for CDM registration[90]
Hubei Dangyang 25MW biomass power generation projetct	25MW	Applying for CDM registration[91]

Sub-step 4b. Discuss any similar options that accruing.

Based on the above information, we can see that all operational and underway grid-connected biomass power projects (15-100MW) are applying for CDM in CCPG, therefore, the proposed project is not common practice and it is additional.

In conclusion, the proposed project activity passed all criteria of the "combined tool to identify the baseline scenario and demonstrate additionality". The baseline scenario 2 in the methodology is the realistic and credible baseline scenario and the proposed project is additional.
ACM0006 requires that the "Combined tool to identify the baseline scenario and demonstrate additionality" is used. Therefore, please refer to the section above where the additionality has been determined.

The CDM consideration and decision making process is presented as follows:
Wuhan Kaidi Investment Holding Ltd. is the parent company of the project owner who wanted to invest and develop grid-connected biomass combustion projects for a long time but due to the high cost, low profit of biomass power plants in China, Wuhan Kaidi Investment Holding Ltd. found it is not feasible to invest in biomass project at that time. Then they learned that some biomass projects were applying for

[82] http://cdm.unfccc.int/Projects/Validation/DB/5WDK7SQ8Z7OYEG7TW3X25RU72VCM74/view.html
[83] http://cdm.unfccc.int/Projects/Validation/DB/BDE8MXZNOI25W8JO2W0IA7PJPGGGDZ/view.html
[84] http://cdm.unfccc.int/Projects/Validation/DB/WYFP4RF43D83YLCPZ4NNBJRBD3D0F3/view.html
[85] http://cdm.unfccc.int/Projects/Validation/DB/TBK7QML7QUL5BD8EUISDXEZRUX31FE/view.html
[86] http://cdm.unfccc.int/Projects/Validation/DB/YPQRM9TRIHHFJTJXNB2OOXIJOKJGFH/view.html
[87] http://cdm.unfccc.int/Projects/Validation/DB/VM71WQ7NGHENFLOL6S1X57OM8M2FSD/view.html
[88] http://cdm.unfccc.int/Projects/Validation/DB/8J8WAZ0YD76CKQWT0XB7XXJP2RMTIS/view.html
[89] http://cdm.unfccc.int/Projects/Validation/DB/34TZ5Z5ZOCUNYOOBNS45X2DLN37CY0/view.html
[90] http://cdm.unfccc.int/Projects/Validation/DB/QA3ZY26J4L9BL0AKFEGBHN48RSAAID/view.html
[91] http://cdm.ccchina.gov.cn/website/cdm/pdf/Item/Item3018.pdf

CDM and began to learn about CDM and consider seeking help from CDM financing. The financial result in the FSR shows that with CER revenue, the IRR of the project is above benchmark, while the IRR is below benchmark without CER revenue. Therefore, Wuhan Kaidi Investment Holding Ltd determined to develop the biomass project as CDM project.

TableB-13 Timelines in Project Implementation and CDM application activities

Time	Project Implementation Activities	CDM Application Activities
May., 2007	EIA was finished	
Jul., 2007	EIA was approved by Environment Protection Bureau of Hunan Province	
Jun., 2007	FSR was finished, which showed that without CER revenue, the project is not feasible and pointed out clearly to implement the project as CDM project can make the project financially attractive.[92]	
Aug., 2007	Project was approved by DRC of Hunan Province	
September 2007		The management board's decision was made and issued to undertake the proposed project as CDM project.[93]
November 2007		Carbon Assets Development Agreement was signed with CAMCO[94]
November 2007	Key Equipment Purchase agreement signed[95]	Project Starting Date in the PDD
February 2008	Construction started	
December 2007-July 2008		PDD writing, Emission Reduction Purchase Agreement negotiating and DOE selecting
August 2008		Validation Contract was signed with DOE
September 2008		Application documents were submitted to NDRC
September 2008		PDD was published on UNFCCC website for Global stakeholder consultation
October 2008		Global stakeholder consultation finished, no comments were received
October 2008		Validation Site Visit
December 2008		CDM application is approved by NDRC of China

[92] FSR Volume 3 Page 7,-10
[93] Boarding minutes
[94] Signature pages of the Carbon Assets Development Agreement
[95] Signature pages of the equipment purchase agreement

Based on the analysis in B.4 and the above description, the CDM was a serious consideration in the decision to proceed with the project and the proposed project is additional.

B.6. Emission reductions
B.6.1. Explanation of methodological choices
>>

EMISSION REDUCTION

The Project reduces CO_2 emissions through substitution of power and heat generation with fossil fuels by energy generation with biomass residues. The emission reduction ER_y by the project during a given year y is the difference between the emission reductions through substitution of electricity generation with fossil fuels ($ER_{electricity,y}$), the emission reductions through substitution of heat generation with fossil fuels ($ER_{heat,y}$), project emissions (PE_y), emissions due to leakage (L_y) and, where this emission source is included in the project boundary and relevant, baseline emissions due to the natural decay or burning of anthropogenic sources of biomass residues($BE_{biomass,y}$), as equation (1):

$$ER_y = ER_{heat,y} + ER_{electricity,y} + BE_{biomass,y} - PE_y - L_y \quad (1)$$

Where,

ER_y = Emissions reductions of the Project during the year y (tCO_2/yr)

$ER_{heat,y}$ = Emission reductions due to displacement of heat during the year y (tCO_2/yr)

$ER_{electricity,y}$ = Emission reductions due to displacement of electricity during the year y (tCO_2/yr)

$BE_{biomass,y}$ =Baseline emissions due to natural decay or burning of anthropogenic source of biomass residues during the year y(tCO_2/yr)

PE_y = Project emissions during the year y (tCO_2/yr)

L_y = Leakage emissions during the year y (tCO_2/yr)

The baseline, project, and leakage emissions are calculated respectively as following:

A. PROJECT EMISSIONS

According the Table in B.3, the project emissions include:

- CO_2 emissions from transportation of biomass residues to the project site (PET_y),
- CO_2 emissions from on-site consumption of fossil fuels due to the project ($PEFF_y$),
- CO_2 emissions from consumption of electricity ($PE_{EC,y}$)
- Where this emission source is included in the project boundary and relevant: CH_4 emissions from the combustion of biomass residues($PE_{biomass,CH4,y}$)

Project emissions are calculated as follows:

$$PE_y = PET_y + PEFF_y + PE_{EC,y} + GWP_{CH4} \times PE_{Biomass,CH4,y} \quad (2)$$

Where,

PET_y = CO_2 emissions during the year y due to transportation of the biomass residues to the project site (tCO_2/yr)

$PEFF_y$ = CO_2 emissions during the year y due to fossil fuel consumption at the project site that is attributable to the project (tCO_2/yr)

$PE_{EC,y}$ = CO_2 emissions during the year y due to electricity consumption at the project site that is attributable to the project (tCO_2/yr)

GWP_{CH4}=Global Warming Potential for methane valid for the relevant commitment period

$PE_{biomass,CH4,y}$= CH_4 emissions from the combustion of biomass residues during the year y(tCH_4/yr)

a) Carbon dioxide emissions from combustion of fossil fuels for transportation of biomass residues to the project plant (PET_y)

Because the biomass residues will be transported to the power plant around the project site by trucks, CO_2 emissions from vehicles should be determined. According to the methodology ACM0006, it could be calculated by the following formula based on the distance and vehicle type (option 1):

$$\mathrm{PET}_y = N_y \times AVD_y \times EF_{km,CO2,y} \qquad (3)$$

Where,

PET_y = CO_2 emissions during year y due to transport of the biomass residues to the project plant (tCO_2/yr)

N_y = Number of truck trips during the year y

AVD_y = Average round trip distance (from and to) between the biomass residue fuel supply sites and the site of the Project plant during the year y (km)

$EF_{km,CO2,y}$ = Average CO_2 emission factor for the trucks measured during the year y (tCO_2/km);

b) Carbon dioxide emissions from on-site consumption of fossil fuels ($PEFF_y$)

According to the Feasibility Study Report, the fossil fuels (diesel oil) are only used for boiler start-up, the emissions from combusting fossil fuels are calculated as "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" as following:

$$PEFF_y = PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y}$$

$$= \sum_i (FF_{projectplant,i,y} + FF_{projectsite,i,y}) \times COEF_{i,y} \qquad (4)$$

Where,

$PE_{FC,j,y}$ = CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2 / yr);

$FC_{i,j,y}$= Quantity of fossil fuel type i combusted at the project site that are attributable to the project activity during the year y (mass or volume unit per year)

$FF_{projectplant,i,y}$= Quantity of fossil fuel type *i* combusted in the biomass residue fired power plant during the year *y* (mass or volume unit per year)

$FF_{projectsite,i,y}$=Quantity of fossil fuel type *i* combusted at the project site for other purposes that areattributable to the project activity during the year *y* (mass or volume unit per year)

$COEF_{i,y}$ = CO_2 emission coefficient of fuel type i in year y (tCO_2 / mass or volume unit);

i = fuel types combusted in process j during the year y.

The "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" provides two procedures to determine $COEF_{i,y}$. Option A: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on the chemical composition of the fossil fuel type i, using the following approach:

If $FC_{i,j,y}$ is measured in a mass unit: $$COEF_{i,y} = w_{C,i,y} \times 44/12 \quad (5)$$

If $FC_{i,j,y}$ is measured in a volume unit: $$COEF_{i,y} = w_{C,i,y} \times \rho_{i,y} \times 44/12 \quad (6)$$

Where:

COEFi,y=Is the CO2 emission coefficient of fuel type i (tCO2/mass or volume unit);

wC,i,y=Is the weighted average mass fraction of carbon in fuel type i in year y (tC/mass unit of the fuel);

ρi,y=Is the weighted average density of fuel type i in year y (mass unit/volume unit of the fuel)

i=Are the fuel types combusted in process j during the year y

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad (7)$$

Where,

$NCV_{i,y}$ = weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit);

$EF_{CO2,i,y}$ = weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ);

Since there is no information of the carbon volume of the fuel provided by the fuel supplier in the invoices and it will cost the project owner a plenty of money to do the measurements by some laboratories having ISO17025 accreditation for each fuel delivery according to the methodology, which is not economically practical to such a small amount of uncontinuous consumption for the project owner, therefore, carbon volume of the fuel is not practically available and Option A is not chosen here and Option B is chosen for the project.

c) CO_2 emissions from electricity consumption ($PE_{EC,y}$)

CO_2 emissions from on-site electricity consumption ($PE_{EC,y}$) should be calculated using the latest approved version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". Little electricity will be consumed for the biomass residues mechanical treatment by the project plant. The emissions are calculated as Scenario A in Generic approach of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" as follows:

$$PE_{EC,y} = \sum_{j} EC_{PJ,j,y} \cdot EF_{EL,j,y} \cdot (1 + TDL_{j,y}) \qquad (8)$$

Where,

$PE_{EC,y}$ = project emissions from electricity consumption in year y (tCO_2 / yr);

$EC_{PJ,j,y}$ = quantity of electricity consumed by the Project electricity consumption source j in year y (MWh);

$EF_{EL,j,y}$ = emission factor for electricity generation for source j in year y. (tCO_2/MWh)

$TDL_{j,y}$ = average technical transmission and distribution losses for providing electricity to source j in year y. The default value of 20% is used here.

j = source of electricity consumption in the Project.

In this case, refer to the description of project boundary; the only source of j is the CCPG

According to the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"(Version 01), the proposed project belongs to Scenario A: Electricity consumption from the grid, so, we choose Option A1: Calculate the combined margin emission factor of the applicable electricity system, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system" ($EF_{EL,j/k/l,y} = EF_{grid,CM,y}$).

d) Methane emissions from Biomass residues combustion

Emissions from this source are calculated as follows:

$$PE_{Biomass,CH4,y} = EF_{CH4,BF} \cdot \sum_{k} BF_{k,y} \cdot NCV_{k} \qquad (9)$$

where:
$PE_{biomass,CH4,y}$: Project emissions from biomass controlled burning (tCH_4/yr)
$BF_{k,y}$: Quantity of biomass residue type *k* combusted in the project plant during the year *y* (ton of dry matter or litter)
NCV_k : Net calorific value of the biomass residue type *k* (GJ/ton of dry matter or GJ/liter)
$EF_{CH4,BF}$; CH_4 emission factor for the combustion of biomass residues in the project plant (tCH_4/GJ)

This PDD calculates EF_{CH4} using the following IPCC default data from Table4 and Table5 of the methodology. The biomass residues used in the proposed project are rice husk, straws and forestry residues which can be the best characterized as other solid biomass residues in line with relevant decisions by the Executive Board:

A	B	C	D	E
Waste type	**Default emission factor(kg CH4/TJ)**	**Assumed uncertainty**	**Conservativeness factor**	**Conservative EF,B×D(kg CH4/TJ)**
Other solid biomass residues	30	300%	1.37	41.1

Therefore, a conservative emission factor of 41.1 kg CH4/TJ is obtained.

B. EMISSION REDUCTIONS DUE TO DISPLACEMENT OF ELECTRICITY

According to the methodology ACM0006, emission reductions due to the displacement of electricity are calculated by multiplying the net quantity of increased electricity generated with biomass residues as a

result of the project activity (EG_y) with the CO_2 baseline emission factor for the electricity displaced due to the project ($EF_{electricity,y}$), as follows:

$$\mathrm{ER}_{electricity,y} = EG_y \cdot EF_{electricity,y} \tag{10}$$

Where,

$ER_{electricity,y}$ = Emission reductions due to displacement of electricity during the year y (tCO_2/yr)

EG_y = Net quantity of increased electricity generation as a result of the Project (incremental to baseline generation) during the year y (MWh).

$EF_{electricity,y}$ = CO_2 emission factor for the electricity displaced due to the Project during the year y (tCO_2/MWh)

In this case, all the electricity displaced is from the CCPG.

STEP 1: Determination of $EF_{electricity,y}$

The Project has been identified as the scenario 2 of ACM0006, i.e. the baseline of the power generation is P4 – "The generation of power in the grid", the emission factor for the displacement of electricity should correspond to the grid emission factor ($EF_{electricity,y} = EF_{grid,y}$). As the installed capacity of the Project is more than 15MW, the $EF_{grid,y}$ shall be determined as a combined margin (CM), following the guidance in the section "Baselines" in the "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002).

Referring to the relevant chapter of ACM0002, the combined margin (CM) should be calculated according to the "Tool to calculate the emission factor for an electricity system" (hereafter referred to as the Emission Factor Tool).

Sub-step 1: Identify the relevant electricity systems

According to the latest guidelines issued on 30th, December 2008 by China' DNA[4], the geographical boundary of CCPG covers, Jiangxi Power Grid, Henan Power Grid, Hunan Power Grid, Hubei Power Grid, Sichuan Power Grid and Chongqing Power Grid. For the purpose of determining the operating margin emission factor, the methodology provides following four options to determine the CO_2 emission factor for net electricity import from the CCPG:

(a) 0 tCO_2/MWh, or
(b) The weighted average operating margin (OM) emission rate of the exporting grid; or
(c) The simple operating margin emission rate of the exporting grid; or
(d) The simple adjusted operating margin emission rate of the exporting grid.

For this project activity, we choose option (b) to calculate the OM emission rate of the CCPG.

Sub-step 2: Choose whether to include off-grid power plants in the project electricity system

Option I: Only grid power plants are included in the calculation.
Optional II: Both grid power plants and off-grid power plants are included in the calculation.

Option I corresponds to the procedure contained in earlier versions of the tool. Option II allows the inclusion of off-grid power generation in the grid emission factor.

According to Chinese administrative regulation for power plants, all power plants should be connected to power grid. The power grids undertake most of power supply. Therefore, only gird power plants are included in the calculation. Accordingly, Option I is applicable to the project activity.

Sub-step 3: Select an operating margin (OM) method

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

a) Simple OM

b) Simple adjusted OM

c) Dispatch data analysis OM

d) Average OM

Option b needs the annual load duration curve of the gird. The data required by this method is not publicly available in China. This option is not applicable.

Option c requires the detailed operating and dispatch data of power plants within the grid, but the dispatch data for the Central China Power Network is not publicly available. This option is not applicable.

Option d can be only used when low-cost/ must run resources account for more than 50% of the total amount of grid power generation. As shown in table A1 of appendix 4 the CCPG is a coal-fired dominated power grid, where the installed capacity of low cost and must run plants account for 35.95%, 43.81%, 37.89%, 38.60% and 35.12% in 2002, 2003, 2004, 2005 and 2006 respectively. The fractions are all below 50%, so this option is not applicable.

Therefore the Simple OM is selected and the emission factor is calculated using the following data vintage:

Ex-ante option: A 3-year generation weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period.

Sub-step 4: Calculate the operating margin emission factor according to selected method

The Simple OM emission factor $EF_{grid,OM,y}$ is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-operating cost and must-run power plants/units. It may be calculated:

- Based on data on fuel consumption and net electricity generation of each power plant/unit (Option A)
- Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B)
- Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (Option C)

According to the “Tool to calculate the emission factor for an electricity system (Ver02)”, option A should be preferred and must be used if fuel consumption data is available for each power plant / unit. In other cases, option B or option C can be used. For the purpose of calculating the simple OM, Option C should only be used if the necessary data for option A and option B is not available and can only be used if only nuclear and renewable power generation are considered as low-cost / must-run power sources and if the quantity of electricity supplied to the grid by these sources is known.

For the proposed project, the data on fuel consumption, net electricity generation and the average efficiency of each power unit are unavailable, thus option A and option B cannot be used. Nevertheless, the data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system are available, and, nuclear and renewable power generation are considered as low-cost / must-run power sources and the quantity of electricity supplied to the grid by these sources is known, therefore, Option C can be used, and the simple OM emission factor is calculated as below:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \cdot \times NCV_{i,k} \times EF_{CO2,i,y}}{EG_y} \quad (11)$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO2 emission factor in year y (tCO2/MWh)

$FC_{i,y}$ = Amount of fossil fuel type i consumed 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 (TJ/mass or volume unit)

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

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 = Three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option)

Based on calculation from the China DNA (see appendix 4, the OM Emission Factor of the Central China Power Grid is 1.2783 tCO_2e/MWh.

Sub-step 5: Identify the cohort of power units to be included in the build margin (BM)

According to the tool to calculate the emission factor for an electricity system, the sample group of power units m used to calculate the build margin could consist of either:

(a) the set of five power plants that have been built most recently, or

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

The tool also states that project participants should use the set of power units that comprises the larger annual generation. In this case option (b) is used.

In terms of the vintage of the data Option 1 is chosen: For the first crediting period, the build margin emission factor is calculated 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.

Sub-step 6: Calculate the build margin emission factor

According to the tool, the build margin emission 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:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (12)$$

Where:

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

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

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y

m = Power units included in the build margin

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

Following guidance issued by the CDM Executive Board in response to a request for guidance from an accredited DOE on the determination of the Build Margin in methodology AM0005 in China[96], $EF_{BM,y}$ is calculated as the capacity weighted average emissions factor of new installed capacity rather than the generation weighted factor. Furthermore, it is suggested in the same guidance note that the efficiency level of the best technology commercially available in the provincial/regional or national grid of China is used as a conservative proxy for each fuel type in estimating the fuel consumption when calculating the Build Margin. The suggested approach is followed in the determination of the Build Margin for the purposes of this project.

Because capacities of technologies using coal, oil and gas cannot be separated from the total thermal power generation from available statistics, the following method is used for the calculation: first, use the recent one year available energy balance data and calculate 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.

The steps and equations are as follows:

1. Calculate percentages of CO_2 emission of power generation using solid, liquid and gas fuel in total CO_2 emission.

[96] http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (13)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (14)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (15)$$

Where,

$F_{i,j,y}$ = amount of fuel i (tce) consumed by power plants m in year y,

COAL, OIL and GAS refer to coal fuel, oil fuel and gas fuel in the subscript set.

2. Calculate thermal emission factor

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$$
(16)

Where,

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are emission factors corresponding to commercially optimal efficient power generation technology using coal, oil and gas.

3. Calculate the BM of the Grid

$$EF_{Grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (17)$$

Where,

CAP_{Total} = newest 20% added total capacity,

$CAP_{Thermal}$ = newly added thermal power capacity.

The data used to calculate OM and BM emission factors are all publicly available. The generation data and average self consumption rate data are from publicly available China Electric Power Yearbooks. The data of fuel consumption per electricity generated and net calorific values of fuels are from the China Energy Statistical Yearbooks. The $OXID_i$ and $EF_{CO2,i}$ data by fuels are from the “2006 IPCC Guidelines for National Greenhouse Gas Inventories,” Volume 2 Energy.

According to the announcement "China's Regional Grid Baseline Emission Factors Renewed", the weighted average of coal consumption per kWh supplied of 30 new built 600 MW sub critical units in 2006 is adopted to determine the emission factor of the best advanced coal fired generation technology, which is 329.94gce/kWh. In other words, the efficiency of best advanced coal fired generation technology is 37.28%.

The maximum electricity supplied efficiency of oil and gas fired generation plants are regarded as approximate estimation of commercially optimal efficiency technology. Similarly, the fuel consumption per kWh supplied of best advanced oil and gas fired generation technology is determined to be 252 gce/kWh, which means a generation efficiency of 48.81%.

According to the Chinese DNA[4], the $EF_{Grid,BM,y}$ for the Central China Power Grid is 0.6687 tCO_2e/MWh. For the data source and the calculations, please see appendix 4.

Sub-step 7: Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_y = w_{OM} \cdot EF_{Grid,OM,y} + w_{BM} \cdot EF_{Grid,BM,y} \qquad (18)$$

Where,

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

$EF_{grid,BM,y}$ = Build 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 defaults weights are used, i.e. each of the Operating Margin and Build Margin is weighted equally.

$w_{OM} = w_{BM} = 0.5$

In this case, for the first crediting period:

$EF_{grid,CM,y}=0.5\times EF_{grid,OM,y} + 0.5\times EF_{grid,BM,y} = 0.9735 tCO_2/MWh$

STEP 2: Determination of EG_y

Where scenario 2 applies, EG_y corresponds to the net quantity of electricity generation in the Project plant ($EG_y = EG_{project\ plant,y}$).

C. EMISSION REDUCTIONS OR INCREASES DUE TO DISPLACEMENT OF HEAT

The proposed project will not claim GHG emission reductions from displacing heat that would otherwise be produced within Quyuan Management District.

$$ER_{heat,y} = 0 \qquad (19)$$

D. BASELINE EMISSIONS DUE TO NATURAL DECAY OR UNCONTROLLED BURNING OF BIOMASS RESIDUES

$BE_{biomass,y}$ is determined in 2 steps:

Step1: Determination of the quantity of biomass residues used as a result of the project activity
Step2: Estimation of methane emissions, consistent with the baseline scenario for the use of biomass residues

Step1 Determination of the quantity of biomass residues used as a result of the project activity ($BF_{PJ,k,y}$)

Where scenario 2 applies, the total quantity of biomass residues used in the project plant ($\sum BF_{k,y}$)is attributable to the project activity and hence $BF_{PJ,k,y} = BF_{,k,y}$, namely the quantity of biomass residues of type k combusted in the project plant during the year y (tons of dry matter or litter)

Step 2 Estimation of methane emissions

As shown above, the baseline scenario is B1 and B3 (uncontrolled burning or aerobic decay of the biomass residues), therefore the emissions from avoided disposal of the biomass to be used by the project activity in year *y* can be calculated as shown below. This assumes that for both B1 and B3, that the biomass residues would be burned in an uncontrolled manner.

:

$$BE_{biomass,y} = GWP_{CH4} \cdot \sum_k BF_{PJ,k,y} \cdot NCV_k \cdot EF_{burning,CHA,k,y} \qquad (20)$$

where:
$BE_{biomass,y}$: Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year *y* (tCO_2e/yr)

GWP_{CH4} : Global Warming Potential of methane valid for the commitment period (tCO_2e/tCH_4)

$BF_{PJ,k,y}$: Incremental quantity of biomass residue type *k* used as a result of the project activity in the project plant during the year *y* (tons of dry matter or litter), for this project, $BF_{PJ,k,y} = BF_{k,y}$

NCV_k : Net calorific value of the biomass residue type *k* (GJ/ton of dry matter or GJ/litter)

$EF_{burning,CH4,k,y}$: CH_4 emission factor for uncontrolled burning of the biomass residue type *k* during the year *y* (tCH_4/GJ)

As lack of more accurate information, the IPCC value 0.0027tCH4 per ton of biomass is used as default value for the product of NCV_k and $EF_{burning,CH4,k,y}$ which is recommended by the baseline methodology.

Furthermore, the uncertainty can be deemed to be greater than 100%, resulting in a conservativeness factor of 0.73, according to Table 6 of the methodology. This conservativeness factor is then multiplied with the estimate for the CH4 emission factor given above. Thus the emission factor of 0.001971t CH4/t of biomass residue is used here.

E. LEAKAGE

Option L2 (ACM0006, Section Leakage) is used to demonstrate that there is an abundant surplus of biomass residues in the region of the project activity, and then the leakage can be neglected.

L2: Demonstrate that there is an abundant surplus of the biomass residue in the region of the project activity which is not utilized. For this purpose, demonstrate that the quantity of available biomass residue of type k in the region is at least 25% larger than the quantity of biomass residues of type k that are utilized, including the project plant.

The geographical boundary in the biomass availability report is covering a radius of 100 km around the project site.

The biomass residue availability report was done by the FSR designer with support from the local authorities on the plantation area and crop yield. The values of each ratio grain to straw are official published experienced data. The biomass amount is provided by local government. The loss rates for straws, rice husk and forestry residues are experienced data. The consumption amount for uses other than the project are done by survey on the local farmers and rice mill owners and confirmed by local Agriculture Bureau and Forestry Bureau.

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Based on the feasibility study report and the biomass residue availability research report, currently, the biomass residues to be used in the proposed project are: rice husk, rice straw, maize straw wood chips branches and barks and their availabilities are summarized as follows:

Table B-14 Biomass availabilities [97]

	Rice husks	Rice straws	Maize straws	Wood chips	Branches	Barks
Available Biomass in the region (10000t)	27.71	97.33	79.27	49.50		
Biomass utilized out of the project (10000t)	5.54	19.47	15.85	7.43		
Biomass utilized by the project (10000t)	15.00	10.00	3.00	11.00	3.500	6.08
Total biomass utilized, including the project (10000t)	20.54	29.47	18.85	28.01		
Available Biomass/Total biomass utilized	135%	330%	420%	177%		

97 Note: Biomass Availability Report of the project, Wuhan Kaidi Electric Power Engineering Co., Ltd. , 2011

Available Biomass/Total biomass utilised - 100%	35%	230%	320%	77%
Abundant surplus? (more than 25%)	Yes	Yes	Yes	Yes

Since the biomass residues have changed, the new biomass quantity utilized by the project has been calculated by the FSR institute. In the same condition of 6000 operational hours at full load, the total energy input from biomass residues is 4291.79TJ, which is almost equal to that in the FSR of the project (4291.69 TJ[98]). The new values of biomass consumption quantity, moisture and NCV are given in table B-15.

Table B-15 Biomass consumption in the project plant and energy input calculation [99]

Biomass Type	rice husk	Rice straw	Maize straw	Wood chips	Branches	Barks
Wet Weight(t)	150000	100000	30000	110000	35000	60800
Moisture	13.91%	28.53%	29.70%	31.78%	29.22%	32.01%
Dry Weight(t)	129135	71470	21090	75042	24773	41338
NCV (GJ/t)	12.86	11.18	11.35	11.26	11.29	11.32
Energy input(TJ)	1660.68	799.03	239.37	844.97	279.69	467.95
Total energy input (TJ)	4291.69					

Based the analysis above, we can find out that the quantity of available biomass residues in the defined geographical boundary are far larger than 25% the quantity of biomass residues utilized in the project. Thus the utilization of the biomass residues by the project plant is considered to have no influence on the current biomass usage, and therefore the leakage of proposed project is considered to be 0. The project owner will guarantee the consumption volume of each biomass type not exceeding the limited volume mentioned in the above table to avoid leakage. Since the proposed project is designed to handle various types of biomass residues not only the biomass types mentioned in the PDD, the project owner will monitor the project utilization amount of each biomass type and the availabilities once collecting it to evaluate its leakage.

In conclusion, the Project does not result increase of fossil fuel consumptions, i.e. the leakage is zero (L_y = 0 tCO_2e). The real situation of Leakage will be monitored once the project owner begins collecting biomass residues.

[98] Explanation on the biomass adoptability for Yueyang , the FSR institute
[99] Explanation on the biomass adoptability for Yueyang , the FSR institute

B.6.2. Data and parameters fixed ex ante
(Copy this table for each piece of data and parameter.)

Data / Parameter	GWP_{CH4}
Unit	tCO_2e/tCH_4
Description	Global warming potential for methane valid for the relevant commitment period
Source of data	IPCC
Value(s) applied	Before 1 January 2013, 21 for the first commitment period is adopted, and from 1 January 2013 onwards 25 for the second commitment period is adopted. Shall be updated according to any future COP/MOP decisions.
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data / Parameter	$FC_{i,y}$
Unit	t (m^3)
Description	Consumed quantity of fuel *i* in year(s) *y* by power plants in CCPG
Source of data	China Energy Statistical Yearbook
Value(s) applied	Refer to Appendix 4
Choice of data or Measurement methods and procedures	Detailed fuel consumption data of individual thermal power plants is not available to the public. The total consumption of various fuels is used instead.
Purpose of data	Calculation of baseline emissions
Additional comment	Official data, used for OM and BM calculation

Data / Parameter	$COEF_i$
Unit	$tCO_2/t(m^3)$
Description	CO_2 emission coefficient of fuel *i* (tCO_2 / mass or volume unit of the fuel)
Source of data	Calculated
Value(s) applied	Refer to Appendix 4
Choice of data or Measurement methods and procedures	Calculated according to the methodology
Purpose of data	Calculation of project emissions
Additional comment	None

Data / Parameter	$GEN_{i,y}$
Unit	MWh
Description	$GEN_{j,y}$ is the electricity (MWh) delivered to the CCPG from power plant using fuel *i* in year(s) *y* (Excluding low cost/must run power plants)
Source of data	China Electric Power Yearbooks
Value(s) applied	Refer to Appendix 4
Choice of data or Measurement methods and procedures	Operation data of individual power plants is not available to the public. Summary data is adopted instead.
Purpose of data	Calculation of baseline emissions
Additional comment	Official data, used for OM and BM calculation

Data / Parameter	$CAP_{i,y}$
Unit	MW
Description	Installed capacity of power plants using fuel *i* in year(s) *y* in CCPG
Source of data	China Electric Power Yearbooks
Value(s) applied	Refer to Appendix 4
Choice of data or Measurement methods and procedures	Operation data of individual power plants is not available to the public. Summary data is adopted instead.
Purpose of data	Calculation of baseline emissions
Additional comment	Official data, used for OM and BM calculation

Data / Parameter	NCV_i
Unit	TJ/t(m^3)
Description	Net calorific value of fuel *i*
Source of data	China Energy Statistical Yearbooks
Value(s) applied	Refer to Appendix 4
Choice of data or Measurement methods and procedures	According to the requirement of methodology, country specific value is used.
Purpose of data	Calculation of baseline emissions
Additional comment	None

Data / Parameter	$OXID_i$
Unit	%

Description	*$OXID_i$* is the oxidation factor of the fuel *i*
Source of data	IPCC default value
Value(s) applied	Refer to Appendix 4
Choice of data or Measurement methods and procedures	According to the requirement of methodology, IPCC default value is adopted.
Purpose of data	Calculation of baseline emissions
Additional comment	Official data, used for OM and BM calculation

Data / Parameter	Eff_i
Unit	%
Description	Power generation efficiency of commercially applicable technology of fuel *i* in CCPG at present time
Source of data	China CDM DNA
Value(s) applied	Refer to Appendix 4
Choice of data or Measurement methods and procedures	According to the deviation method of EB, technology with maximum efficiency utilized can be the representative of such kind technology.
Purpose of data	Calculation of baseline emissions
Additional comment	Official data, used for OM and BM calculation

Data / Parameter	$EF_{CO2,i}$
Unit	tCO_2/TJ
Description	Carbon content of fuel used for power generation
Source of data	IPCC default value
Value(s) applied	Refer to Appendix 4
Choice of data or Measurement methods and procedures	According to the requirement of methodology, IPCC default value is adopted.
Purpose of data	Calculation of baseline emissions
Additional comment	Official data, used for OM and BM calculation

Data / Parameter	$TDL_{j,y}$
Unit	%
Description	average technical transmission and distribution losses for providing electricity to source j in year y.

Source of data	Tool to calculate baseline, project and/or leakage emissions from electricity consumption
Value(s) applied	20
Choice of data or Measurement methods and procedures	Because the data is not available within host country, the default value (20%) can be adopted for project emission calculation according to the Tool to calculate baseline, project and/or leakage emissions from electricity consumption. Since in China, the average TDL for the power sector during 2008-2006 has been estimated to be between 7%-9% only and it is expected to be decreased to about 6% by year 2020[100], therefore, the value used here is conservative.
Purpose of data	Calculation of project emissions
Additional comment	None

Data / Parameter	$EF_{CH4,BF}$
Unit	tCH_4 /GJ
Description	CH_4 emission factor for controlled burning of the biomass residue in the project plant
Source of data	IPCC 2006 Default Value ; ACM0006
Value(s) applied	41.1 Where the default CH4 emission factor of 30kg/TJ is used, the uncertainty is estimated to be 300%, resulting in a conservativeness factor of 1.37. Thus, in this case the value of this parameter is: $EF_{CH4,BF}$=30*1.37=41.1
Choice of data or Measurement methods and procedures	It is calculated using the conservative IPCC 2006 default values. The conservative factor is applied, as specified in the baseline methodology.
Purpose of data	Calculation of project emissions
Additional comment	None

Data / Parameter	$NCV_k*EF_{burning,CH4,k,y}$
Unit	tCH_4/tonne
Description	CH_4 emission factor for uncontrolled burning of the biomass residue
Source of data	IPCC 2006 Default Value ; ACM0006
Value(s) applied	0.001971 Where the default CH4 emission factor of 0.0027 CH4/t biomass is used, the uncertainty can be deemed to be greater than 100%, resulting in a conservativeness factor of 0.73. Thus this value is used according to ACM0006

[100] http://www.okokok.com.cn/Htmls/GenCharts/080314/7505.html

Choice of data or Measurement methods and procedures	The conservative factor is applied, as specified in the baseline methodology
Purpose of data	Calculation of project emissions
Additional comment	None

B.6.3. Ex ante calculation of emission reductions
>>
Project emissions

a) Carbon dioxide emissions from combustion of fossil fuels for transportation of biomass residues to the project plant (PETy)
According to the Explanation on the Biomass Adaptability for Yueyang Project, the Project is designed to consume 150,000tons rice husk, 100,000tons of rice straws, 30,000tons of maize straws, 110,000tons of wood chips, 35,000tons of branches and 60,800tons of barks annually. Wet quantity of the biomass is used to calculate ***PETy***.

The average distance the trucks travel will not be more than 100km away from the project site, which is from the biomass collection plan. Therefore, AVD_y is adopted as 200km (2 x 100).

Since the direct measurement of diesel consumption per unit distance is costly and complicated ,the CO_2 emission factor for the trucks 0.001097 tCO_2e/km is used, which is IPCC default value from the for Moderate control US Heavy Duty Diesel Trucks and is conservative.

The conservativeness of the emission factor chosen is depicted as follows:

The trucks used in the project are expected to use light diesel with an average load of 10.7t, with the weight of the truck included. It is stated that the average diesel consumption for trucks with load around 10t will be around 20 liter/100km in China[101]. Using the IPCC 2006 default NCV(0.043TJ/t) and EF(20.2 tc/tj) for diesel[102] and the diesel density of 0.85kg/liter[103], the CO_2 emission factor for trucks is just:

20liter/100km x 0.85kg/liter x 0.043tj/t x 20.2tc/tj x 44/12=0.00054 tCO_2e/km, which shows that 0.001097 tCO_2e/km used as the emission factor here is conservative.

Refer to the equation (3), the emissions from biomass residues transportation is calculated as follow:
PET_y = 485,800 t / 10.7t x 200km x 0.001097tCO_2e/km = 9961 tCO_2e.

b) Carbon dioxide emissions from on-site consumption of fossil fuels (PEFFy)
The on-site consumption of fossil fuels is from two sources. The first one is from the start-up diesel whose consumption is estimated as 50t per year. The second source is from the diesel consumption for forklifts at collections sites and project site whose consumption is estimated as 100t per year.

Since the direct measurement of NCV of diesel is not economically practical to such a small amount of uncontinuous consumption and the reliable China Energy Statistical Yearbook is available and updated

[101] http://www.moc.gov.cn/zhuzhan/jiaotongxinwen/xinwenredian/200706xinwen/200709/t20070926_416413.html
[102] 2006 IPCC guidance for National Greenhouse Gas Inventories,Chapter1,Volume 2, Table 1.2 and 1.3
[103] http://en.wikipedia.org/wiki/Diesel

annually. Therefore, 0.042652 TJ/t is used as the NCV of diesel which is from China Energy Statistical Yearbook 2007.

Since the direct measurement of EF of diesel is not feasible and the reliable local or national data is not available, therefore, 74.1tCO2e/TJ is used as the EF of diesel which is IPCC default value.

Therefore the $PEFF_y$ is calculated as follow:

$PEFF_y$ = (50+100)t x 0.042652 TJ/t x 74.1tCO_2e/TJ = 474tCO_2e.

c) ***<u>CO_2 emissions from electricity consumption ($PE_{EC,y}$)</u>***

As per Table B-15, 130,000 tons of straws and 205,800 tons of forestry residues will be shredded into small piece before combusting in the boiler. The electricity consumption is 0.010MWh for each ton of biomass residues, and it will consume a total of 3,358 MWh for pretreatment of biomass annually. (This electricity consumption only involves the electricity for the biomass residues pretreatment and it is exclusively from the 12% auxiliary consumption of the project).$EF_{EL,j,y}$(=$EF_{grid,CM,y}$) is calculated in Appendix 4 as 0.9735 tCO_2e/MWh, thus the CO2 emissions from electricity consumption (PEEC,y) can be calculated as:

$PE_{EC,y}$ = 3,358MWh x 0.9735tCO_2e/MWh x (1+20%) = 3,923tCO_2e

<u>d) Methane emission from Biomass residues combustion($PE_{biomass,CH4,y}$)</u>

According to Table B-15, the quantity of rice husks, rice straws, maize straws, wood chips, branches and barks consumed annually are 129,135t , 71,470t ,21,090t, 75,042t,24,773t, and 41,338t (dry weight). The weighted mean of NCVs for the six types of biomass is 11.828GJ/T.

The CH_4 emission factor for controlled burning of the biomass residue in the project plant, $EF_{CH4,BF}$=41.1kgCH_4/TJ, which is calculated using the IPCC default values described in the methodology. So, $PE_{biomass,CH4,y}$=362,848 x 0.0118287TJ/tone x 41.1kgCH_4/TJ=176.39tCH_4

Therefore the project emissions are calculated as:

For the second commitment period :PEy = PETy + PEFFy + PEEC,y +GWP_{CH4} x $PE_{biomass,CH4,y}$

= 9,961tCO2e + 474tCO2e + 3,923tCO2e +25*176.39= 18,768tCO2e

For the first commitment period : PEy = PETy + PEFFy + PEEC,y +GWP_{CH4} x $PE_{biomass,CH4,y}$

= 9,961tCO2e + 474tCO2e + 3,923tCO2e +21*176.39= 18,062tCO2e

Emission reductions due to displacement of electricity

<u>Step 1: Determination of $EF_{electricity,y}$</u>

Based on the description in B.6.1 and detailed calculation in Appendix 4 the $EF_{electricity,y}$ = $EF_{grid,y}$ = 0.9735 tCO_2e/MWh.

<u>Step 2: Determination of EG_y</u>

According to the Feasibility Study Report, the delivered electricity is 253,440MWh per year, i.e. EG_y = 253,440MWh. Therefore:

$ER_{electricity,y}$ = 253,440MWh x 0.9735tCO_2/MWh =246,724tCO_2e

Emission reductions or increases due to displacement of heat

The proposed project will not claim GHG emission reductions from displacing heat that would otherwise be produced within Quyuan Management District.

$ER_{heat,y} = 0$

Uncontrolled burning or decay of biomass baseline emission

Step 1 Determination of the quantity of biomass residues used as a result of the project activity

According to Table B-15, the quantity of rice husks, rice straws, maize straws, wood chips, branches and barks consumed annually are 129,135t , 71,470t ,21,090t, 75,042t,24,773t, and 41,338t (dry weight). The weighted mean of NCVs for the six types of biomass is 11.828GJ/T

Step2 Estimation of methane emissions

As lack of more accurate information, the emission factor 0.001971 tCH_4/tonne biomass residue is used in the PDD, which is suggested by the baseline methodology.

So, Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year *y*,

For the second commitment period, from 1 January 2013 onwards:

$$BE_{biomass,y} = GWP_{CH4} \cdot \sum_k BF_{PJ,k,y} \cdot NCV_k \cdot EF_{burning,CHA,k,y}$$

=25tCO_2/ tCH_4 x 362,848 x 0.001971 tCH_4/tonne=17,879tCO_2e

For the first commitment period,before 1 January 2013:

$$BE_{biomass,y} = GWP_{CH4} \cdot \sum_k BF_{PJ,k,y} \cdot NCV_k \cdot EF_{burning,CHA,k,y}$$

=21tCO_2/ tCH_4 x 362,848 x 0.001971 tCH_4/tonne=15,019tCO_2e

Leakage

Based on the description in B.6.1, the leakage of the Project is zero, i.e. $L_y = 0tCO_2e$

Emission Reductions

Refer to the equation (1), the emission reductions are calculated as:

For the second commitment period, from 1 January 2013 onwards:

$ER_y = ER_{heat,y} + ER_{electricity,y} + BE_{biomass,y} - PE_y - L_y = 245{,}835tCO_2e$

For the first commitment period,before 1 January 2013:

$ER_y = ER_{heat,y} + ER_{electricity,y} + BE_{biomass,y} - PE_y - L_y = 243{,}680tCO_2e$

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions ($t\ CO_2e$)	Project emissions ($t\ CO_2e$)	Leakage ($t\ CO_2e$)	Emission reductions ($t\ CO_2e$)
2011[104]	130,871	9,031	0	121,840
2012	130,871	9,031	0	121,840
2013	132,302	9,384	0	122,918
2014	264,603	18,768	0	245,835
2015	264,603	18,768	0	245,835
2016	264,603	18,768	0	245,835
2017	264,603	18,768	0	245,835
Total	1,452,457	102,517	0	1,349,940
Total number of crediting years	7			
Annual average over the crediting period	207,494	14,645	0	192,849

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

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

[104] Considering lacking of operational experiences in Greenfield biomass power plants, the project owner decides to build the project into two phases practically, each of them is 24MW. After the first 24MW is operational stably, the second 24MW will initiate. It is estimated that the construction work of the second 24MW will likely begin two years after the first 24MW begins operation and the commission date of the second 24MW will be one year after it begins construction. The Emission Reductions are all calculated based on the rated operational condition. Moreover, Global Warming Potential of CH4 has adopted 21 for the first commitment period (in 2011 and2012).From 1 January 2013 onwards, Global Warming Potential of CH4 has adopted 25 for the second commitment period.

Data / Parameter	$BF_{k,y}$
Unit	tons *of dry matter*
Description	Quantity of each biomass residue type *k* combusted in the project plant in year *y*.
Source of data	On-site measurements
Value(s) applied	rice husks :129,135t rice straws: 71,470t maize straws: 21,090t wood chips: 75,042t branches:24,773t barks: 41,338t
Measurement methods and procedures	Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity shall be crosschecked with the quantity of electricity and heat generated and any fuel purchase receipts.
Monitoring frequency	Continuously, energy balance will be prepared annually.
QA/QC procedures	The meter will undergo calibration/maintenance subject to appropriate industrial standards. Direct measurements at the plant site will be cross-checked with an annual energy balance that is based on purchased quantities and stock changes
Purpose of data	Calculation of project emission and baseline emission
Additional comment	None

Data / Parameter	**Moisture content of the biomass residues**
Unit	% water content
Description	Moisture content of the biomass residues
Source of data	On-site measurements
Value(s) applied	rice husks :13.91 rice straws: 28.53 maize straws: 29.70 wood chips: 31.78 branches:29,22 barks: 32.01
Measurement methods and procedures	The data will be sampled periodically and analyzed daily by the moisture analyzers in the laboratory of the plant.
Monitoring frequency	Continuously sampled at fixed time period and analyzed daily, Mean values will be calculated at least annually.
QA/QC procedures	The monitoring procedures in the laboratory of the plant will be done according to authoritative instructions or guidance
Purpose of data	Calculation of project emission and baseline emission
Additional comment	None

Data / Parameter	***NCV_K***
Unit	GJ/ton of dry matter
Description	Net calorific value of each biomass residue of type *k*
Source of data	Measurements
Value(s) applied	rice husks :12.86 rice straws: 11.18 maize straws: 11.35 wood chips: 11.26 branches:11.29 barks: 11.32
Measurement methods and procedures	Measurements will be carried out at reputed laboratories and according to relevant international standards. ***NCV_K*** will be measured based on dry biomass.
Monitoring frequency	At least every six months, taking at least three samples for each measurement
QA/QC procedures	The consistency of the measurements will be checked by comparing the measurement results with measurements from previous years, relevant data sources. If the measurement results differ significantly from previous measurements or other relevant data sources, Additional measurements will be conducted.
Purpose of data	Calculation of project emission
Additional comment	None

Data / Parameter	**AVD_y**
Unit	Km
Description	Average round trip distance (from and to) between the biomass fuel supply sites and the project plant during the year y
Source of data	On site records maintained in the log books
Value(s) applied	*200*
Measurement methods and procedures	The data is recorded in the log books based on the information given by the truck driver about the distance from biomass supply site to the project site.
Monitoring frequency	Continuously
QA/QC procedures	The data on distance of fuel supply site from the plant can be verified by cross checking data records on the distances available with Information from other sources (e.g. maps). If data is missing for a particular round trip, the following backup data apply in their order: ♦ The round trip distance between the farthest biomass fuel supply site and the project plant will be used. If the farthest biomass fuel supply site could not be verified, 200km would be used for conservativeness
Purpose of data	Calculation of project emission
Additional comment	None

Data / Parameter	**Ny**
Unit	-
Description	Number of truck trips for the transportation of biomass
Source of data	On site records maintained in the log books
Value(s) applied	45,402
Measurement methods and procedures	Each time every truck which transports biomass residue to the plant will be counted and recorded in the log books.
Monitoring frequency	Continuously
QA/QC procedures	The consistency of the number of truck trips will be checked with the quantity of biomass combusted by the relation with previous years
Purpose of data	Calculation of project emission
Additional comment	None

Data / Parameter	$EF_{km,CO2}$
Unit	tCO_2e/km
Description	Average CO2 Emission Factor for transportation of biomass with trucks during year y
Source of data	IPCC default value
Value(s) applied	0.001097 Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Table 1-32 on Page 1.75) of the Reference Manual (Estimated Emission Factors for US Heavy Duty Diesel Vehicles)
Measurement methods and procedures	Choose emission factors applicable for the truck types used from the literature in a conservative manner. The appropriateness of the data will be reviewed annually
Monitoring frequency	Annually
QA/QC procedures	
Purpose of data	Calculation of project emission
Additional comment	None

Data / Parameter	$EF_{CO2,i,y}$
Unit	$kgCO_2e/TJ$
Description	CO2 emission factor for fossil fuel type i (diesel)
Source of data	IPCC default value
Value(s) applied	74,100 IPCC 2006 default value (Volume2.Chapter2.P16) , diesel emission factor
Measurement methods and procedures	The appropriateness of the data will be reviewed annually
Monitoring frequency	Annually
QA/QC procedures	
Purpose of data	Calculation of project emission
Additional comment	The plant is designed to use diesel at this stage. Should any other fossil fuel be used during operation, the same monitoring procedures apply.

Data / Parameter	NCV_i
Unit	TJ/tonne
Description	Net Calorific Value(NCVi) of fossil fuel type i(diesel)
Source of data	Reliable National Data
Value(s) applied	0.042652 China Energy Statistical Yearbook 2007,Diesel NCV
Measurement methods and procedures	The appropriateness of the data will be reviewed annually
Monitoring frequency	Annually
QA/QC procedures	
Purpose of data	Calculation of project emission
Additional comment	The plant is designed to use diesel at this stage. Should any other fossil fuel be used during operation, the same monitoring procedures apply.

Data / Parameter	***FF**$_{project\ plant,i,y}$*
Unit	*Tonnes*
Description	Quantity of fossil fuel type *i*(diesel) combusted in the project plant during year *y*
Source of data	On-site measurements
Value(s) applied	*50t*
Measurement methods and procedures	The consumption of diesel will be monitored using volume flow meters and recorded by the project participants. This will be converted to the mass of diesel consumed using the standard density of diesel (0.85 kg/litre).
Monitoring frequency	Continuously
QA/QC procedures	The meter will undergo calibration/maintenance subject to appropriate industrial standards. The measurements will be cross-checked by the purchased quantities and stock changes if available.
Purpose of data	Calculation of project emission
Additional comment	There is only diesel used for start-up. The plant is designed to use diesel at this stage. Should any other fossil fuel be used during operation, the same monitoring procedures apply.

Data / Parameter	***FF**$_{project\ site,,i,y}$*
Unit	*Tonnes*
Description	Quantity of fossil fuel type *i* combusted in the project site (including the collection sites) for other purposes that are attributable to the project activity during year *y*
Source of data	On site records maintained in the log books
Value(s) applied	*100*
Measurement methods and procedures	The consumption of diesel will be monitored using Diesel purchase and consumption log book.
Monitoring frequency	Continuously
QA/QC procedures	The data will be cross checked by the purchase receipts.
Purpose of data	Calculation of project emission
Additional comment	This should not include fossil fuels co-fired in the project plant but any other fuel consumption at the project site (including the biomass collections sites) that is attributable to the project activity (e.g. for mechanical preparation of the biomass residues). If there is any fossil fuel used from shredders, forklift or other machines for the mechanical preparation of the biomass residues, it will be recorded. They are supposed to use diesel at this stage. Should any other fossil fuel be used during operation, the same monitoring procedures apply.

Data / Parameter	**$EC_{PJ, y}$**
Unit	MWh
Description	On-site electricity consumption (including the electricity consumption for the mechanical treatment of the biomass in the biomass collection sites and the project site) attributable to the project activity during the year y
Source of data	On-site measurements by meter or calculated conservatively as the weight of biomass residues smashed in tons and the electricity consumption factor (kWh/ton)
Value(s) applied	It is estimated as 3,358MWh.
Measurement methods and procedures	When the biomass residue is mechanically pretreated, the proposed project needs a certain amount of electricity from grid. This amount will be metered or calculated conservatively. If the monitoring data is missing, or it is not feasible to install a dedicated meter to monitor this indicator, it will be calculated conservatively as the weight of biomass residues smashed in tons and the electricity consumption factor (kWh/ton). The electricity factor can be calculated as follows: 1) Collecting all the nameplates power (in kW) and capacity(t/h) of every biomass residues crackers 2) Calculating the electricity factor corresponding to each cracker in kWh/t 3) Using the largest number as a conservative electricity factor for the calculation
Monitoring frequency	Continuously ,aggregated at least annually
QA/QC procedures	Cross-check measurement results with invoices for purchased electricity if available
Purpose of data	Calculation of project emission
Additional comment	None

Data / Parameter	**$EG_{project\ plant,y}$**
Unit	MWh
Description	Net quantity of increased electricity generated in the project plant during the year y
Source of data	On-site measurements
Value(s) applied	253,440
Measurement methods and procedures	Electricity supplied to the grid and purchased from the grid will be monitored by a double way meter and the data will be cross-checked by the invoices and the power transaction note if available. Electricity imported from a 10kv backup power will be monitored by meter and the amount of electricity imported through this line will be checked by the invoice if available. The net electricity equals to electricity supplied to the grid minus electricity purchased from the grid minus electricity purchased from the 10kv backup power. The meters are 0.5 double-way meters.
Monitoring frequency	Continuously
QA/QC procedures	The consistency of the data will be cross-checked with receipts from electricity sales and invoices, if available; and the quantity of fuels fired to see whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency.
Purpose of data	Calculation of baseline emission
Additional comment	None

Data / Parameter	-
Unit	Tons
Description	Quantity of each biomass residues of type k that are utilized in the defined geographical region
Source of data	Surveys or Statistics
Value(s) applied	Table B-14
Measurement methods and procedures	Surveys or statistics from local related official department or other official public resource. If they are not available, the project owner will ask specialized institute or consulting company to do the biomass availability research.
Monitoring frequency	Annually
QA/QC procedures	This parameter will be reviewed annually according to the project data and official data.
Purpose of data	Calculation of leakage
Additional comment	This parameter is applicable since approach L_2 is utilized to rule out leakage.

Data / Parameter	-
Unit	Tons
Description	Quantity of each biomass residues of type k that are available in the region
Source of data	Surveys or statistics
Value(s) applied	Table B-14
Measurement methods and procedures	Surveys or statistics from local related official department or other official public resource. If they are not available, the project owner will ask specialized institute or consulting company to do biomass availability research
Monitoring frequency	Annually
QA/QC procedures	
Purpose of data	Calculation of leakage
Additional comment	This parameter is applicable since approach L_2 is utilized to rule out leakage.

B.7.2. Sampling plan

>>

N/A

B.7.3. Other elements of monitoring plan

>>

This monitoring plan is to serve as a guideline for the project owner to monitor the emission reduction of the proposed project. The contents of the Monitoring Plan are highlighted as follows:

1. The CDM monitoring management

There is a CDM team underway for the proposed project comprising of personnel picked from the power plant who will perform the dual functions of power plant O&M and compliance with the CDM procedures to monitor the project emission reductions and any leakage effects to make sure that the project is in compliance with the CDM monitoring and verification requirements.

The plant manager will be in charge of approving the monitoring report, appointing the CDM manager and the relevant monitoring team members and responsible for the monitoring outcome.

The CDM manager will be responsible for liaising with DOE and the buyers, organizing the relevant training, reviewing all the documents related to the monitoring of the project, correcting any errors in time and acting as the quality supervisor of the monitoring process.

The Operating Manger will be responsible for the monitoring associated with operation of the plant, the net electricity generation,the start-up diesel consumption and the dry biomass combusted. In addition, the Operating Manager will supervise meter maintenance and manage the calibration process.

The Biomass Collecting Manager will be responsible for the monitoring associated with biomass collection, the transportation emissions, the mechanical biomass pretreatment emissions and assisting the annual leakage analysis.

The Financing &Data filing Manager will prepare the available original invoices or receipts associated with the whole monitoring process. Besides, the Financing &Data filing Manager will collect the relevant data from the Operating Manger and the Biomass Collecting Manager summarizes the data, file the data and submit reports to the CDM manager in time.

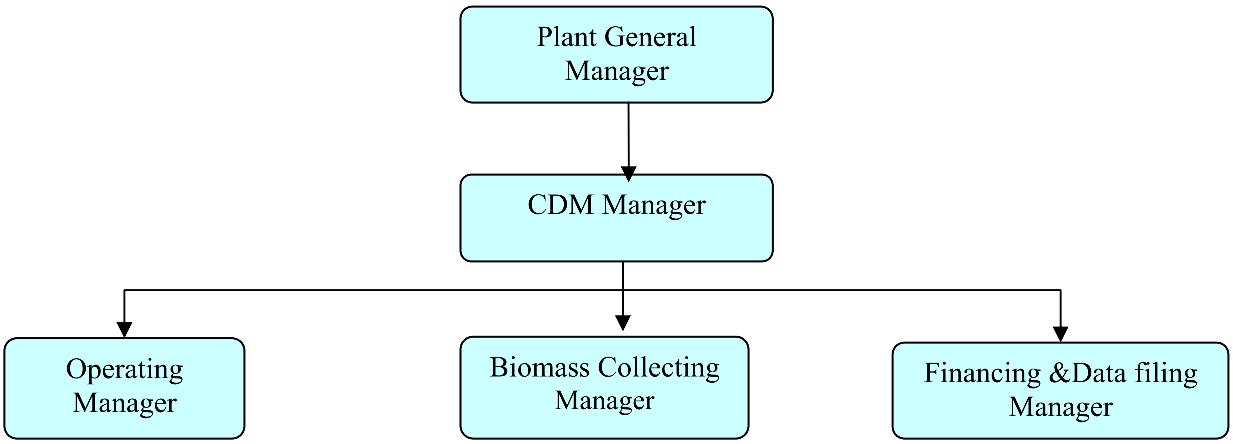

Figure B-7 The CDM monitoring management

2. Monitoring System Design

2.1 Net electricity generation

There will be electricity meter installed on the project site monitoring the electricity supplied to the grid and purchased from the grid. There will be back up meter installed on the project site monitoring the electricity supplied to the grid and purchased from the grid too.

The data of electricity supplied to the grid and purchased from the grid will be measured and cross-

checked by the invoices and the power transaction note if available. The meter is 0.5 double-way meter.

In addition, a 10KV backup power supply will be available in site in the early time of the proposed project and the amount of electricity imported through this line will be monitored and checked by the invoice if available.

2.2 Biomass residues consumption
The amount of the biomass residues combusted in the boiler will be monitored by the belt weigher. The moisture of the biomass combusted will also be monitored by sampled continuously at fixed time period and analyzed daily. An energy balance will be recorded monthly to assist verifying the biomass combusted.

If significant difference among the data sources identified, the project developer will conduct further check the original records to find out reasons and correct. If the significant difference can't be resolved, the most conservative value of biomass utilized by the proposed project will be applied as monitoring results.

2.3 Fossil Fuel Consumption in the power plant
For fossil fuel used for starting up, flow meters will be equipped in the supply and return pipe to monitor the quantity of diesel consumption.

If there is any fossil fuel used for the shredders, forklifts or any other machines for the mechanical biomass pretreatment in the project site （including the biomass collection sites） will be monitored by the diesel purchase and consumption log book.

The purchase receipt will be used for cross-check when the fuel consumption is measured. If there is any data missing or significant error exists, the entire quantity of fossil fuel purchased in a particular monitoring period would be considered as combusted in the power plant for conservativeness.

2.4 Transportation of Biomass residues
The project developer of the proposed project will structure a recording and monitoring system within the biomass residues supply and management system covering all the biomass collection sites established by the proposed project. Each time each truck transporting the biomass into the project site will be counted and recorded in the log book. The transportation distance to the collection sites will be recorded by company staffs at the sites and the data will be recorded in the log books. The data on distance of fuel supply site from the plant can be verified by cross checking data records on the distances available with information from other sources (e.g. maps).

If data is missing for a particular round trip, the following backup data apply in their order:
- The round trip distance between the farthest biomass fuel supply site and the project plant will be used.
- If the farthest biomass fuel supply site could not be verified, 200km would be used for conservativeness

2.5 Electricity consumed on site
When the biomass residue is mechanically pretreated, the proposed project needs a certain amount of electricity from grid. This amount will be metered or calculated conservatively.

If the monitoring data is missing, or it is not feasible to install a dedicated meter to monitor this indicator, it will be calculated conservatively as the weight of biomass residue smashed in tons and the electricity consumption factor (kWh/ton). The electricity factor can be calculated as follows:

1) Collecting all the nameplates power (in kW) and capacity(t/h) of every straw crackers
2) Calculating the electricity factor corresponding to each cracker in kWh/t
3) Using the largest number as a conservative electricity factor for the calculation

2.6 Leakage

Amount of each biomass types consumed and Quantity of each biomass types that is available in surplus in the area that defined in Project Boundary will be monitored to check the leakage effect brought by the operation of the proposed project. This will be obtained from surveys or statistics from related official department or other official public resource. If they are not available, the project owner will ask specialized institute or consulting company to do biomass availability research.

3. Calibration & Maintenance procedures

The meters or monitoring equipment installed in the monitoring system will be calibrated by a certified Party in accordance with the manufacturer's recommendations and National Regulations for ensuring reliability of the system. Calibrations shall be evidenced with certificates of calibration for the relevant meter(s) issued by a qualified body. A calibration and error log will be maintained to provide transparency and sound management.

4. Training, Record Keeping, Error or emergency handling and Reporting Procedures

4.1 Training

Members of staff who are involved in the CDM project will be given training on the CDM and reporting requirements, prior to registration of the project. New members of staff joining the CDM project team will also be given training in relation to their responsibilities. Full training procedures and a training plan will be detailed in the CDM Manual.

4.2 Record Keeping and Internal Reporting Procedure

The data associated with the emission reduction will be kept for at least 2 years after the end of the crediting period or the last issuance of CERs, whichever occurs later.

4.3 Error Handling Procedure

In the event that a meter has lost calibration over the allowable error limit then this shall be corrected at the earliest opportunity and re-calibrated and the data recorded from this meter since the last successful calibration shall be ignored.

The check of the CDM Project manager and then the third party verifier prior to issuance of the CERs is considered adequate for errors in the calculations. Where errors in the calculations are discovered by either of these Parties, the monitoring report shall be modified and the corrected version shall be resubmitted to the verifier.

4.4 External Reporting Procedure

After signing by the CDM Project manager, the report is sent to the third party verifier who is contracted to verify the emissions reductions during the crediting period of the project.

4.5 Procedure for corrective actions arising

The CDM manager is responsible for identifying corrective actions arising from the above procedures and for liaising with the purchaser, the third party verifiers and other stakeholders to take necessary steps to implement the corrective actions.

4.6 Emergency procedures

In the unlikely event of an emergency, set procedures will be followed. Details of the procedures to be followed are described in the relevant Operation Manuals. The key points include:

- The Distributed Control System (DCS) will automatically shut off the boilers upon detecting an emergency.

The operators can also remotely shut off the boilers if they find an emergency situation has occurred.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>

06/11/2007 (Key Equipment Purchase Contract Signed Date, the construction start date is 07/03/2008)

C.1.2. Expected operational lifetime of project activity

>>

20 years

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>

Renewable crediting period

C.2.2. Start date of crediting period

>>

01/01/2011

C.2.3. Length of crediting period

7 years

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>

The EIA of the proposed project was completed by Changsha Environmental Protection Vocational and Technical School and approved by Hunan Environmental Protection bureau. The summary of this evaluation is as following:

1. Air

In the construction period, the waste gas resource is mainly from, such as the road dust during the transporting process , automobile emission , emissions from excavator and bulldozer, and so on. Some measures will be taken to reduce these negative effects: sprinkling to repress the dust, keep the ground humidity, and clear the soil daggered out in time.

After the project being implemented, there will be waste gas from the boiler. Then, the boiler waste gas will be treated by the bag filter, the dust removal efficiency of which is higher than 99.8%. Furthermore, the waste gas will be out though the high chimney (100m height, 2.5m internal diameter) to reduce the air pollution by the air diffusion and self-clean ability.

2. Waste Water

During construction, the waste water is mainly from: rainwater, wash water from all kinds of machinery and automobiles, and domestic wastewater. In the construction site, sedimentation tank and oil separation tank will be constructed to treat the waste water. For the washing water oily and with high suspended matter, it will be discharged after treatment. Mortars and lime mortar will be treated specially, and be sent to treated together with other solid waste after drying.

When the project is in operation, the domestic waste water will be treated by be the second stage biochemical treatment in buried treatment equipments.

In the project operation process, there will be industrial cooling water, which is mainly the cooling water of all kinds of equipments. This cooling water doesn't contact with any harmful substance, and it don't contains any other pollutants except the water temperature is a little higher.
The water will be collected for recovery and the recovery water mainly be used for boiler cooling water, oil region washing water, afforestration and so on. Oily wastewater will be separated the oil and water by the oil-water separator and then reused as industrial water;

3. Noise

During construction, the project noise is mainly from: fixed and successive drilling, construction machinery noise, and fluid traffic noise. The noise in the construction process belongs to the medium and low frequency noise, and they will decay quickly as the distance. Furthermore, some effective measures will be taken to reduce negative impacts: Arrange the construction time reasonably, manage the automobile well, set hovels around the noisy equipments, and so on.

When the project is operated, the noise source is mainly from machinery noise and gas dynamic noise from the exhaust pipe. The noise control measures include: choosing the equipments with high efficiency and little noise, taking vibration reduction measures when fixing equipments, taking sound proof measures to the noisy equipments, to control the noise in the standard range.

4. Solid Waste

The solid waste produced in the construction period is mainly the construction residues and the domestic waste from workers. The construction waste will be collected and treated as soon as possible, and the domestic waste will be collected and sent to local environmental protection department for treatment.

During project operation, the solid waste is mainly: boiler ash residues, domestic waste and sludge from the water treatment station. The ash residues will be used for producing White Carbon Black. The waste and sludge from the water treatment station will be collected by local environmental protection department for municipal treatment.

5. Conclusion

After the above measurements performed, the negative impacts on environments will be minimized below the requirements of laws and regulations during the construction and implementation. Furthermore, as renewable power project, the proposed project can reduce the consumption of fossil fuel sources and GHG emission.

D.2. Environmental impact assessment

>>

According to EIA, no significant environmental impacts are discovered by the project participants or the host party. Hunan Environmental Protection Bureau has approved the EIA in Jul., 23rd, 2007.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

In May 2007, The project owner carried out the investigation stakeholders in Questionnaire. Questionnaire was implemented by filling the stakeholder comments investigation form. The quesionaires were sent out around the Yueyang project plant and the main roads. 50 copies questionnaires were distributed and all of them were collected. Information about the meeting participants is given in the following table.

Besides, a summary of the project's introduction, EIA , questionnaires, contact information of the project was published on the main roads near the project site to invite the local stakeholder to give comments on the project during the EIA report compiling period.

Table E-1 Statistical form for basic information of meeting participants

Basic information	Classified items	Person number	Percentage（%）
Age	younger than 18 year old	6	12%
	between 18 to 35 year old	20	40%
	between 36 to 55 year old	19	38%
	older than 55 year old	5	10%
Occupation	Farmers	26	52%
	Workers	8	16%
	Officials	5	10%
	Staffs	7	14%
	Others	4	8%
Gender	Male	28	56%
	Female	22	44%
Education	under middle school	2	4%
	middle school	26	52%
	Diploma and above	22	44%

The key relevant questions in the questionnaire including:

- Would you consider the project important?
- Do you agree with the construction of the project?
- What is the environmental problem associated with the project that you are most concerned about?
- What is the effect of the project on local ecologic environment?
- Are you satisfied with the methods proposed to alleviate the environment impacts?
- Do you think the project will improve the local economy?

- Do you think the project will improve local employment opportunities?

E.2. Summary of comments received

>>

Among them, 80% interviewees think the proposed project is very important, and 20% think it's important. All of the interviewees agree with the construction of the proposed project.

For the most concerned environmental problem, 42% of them think it's noisy pollution and 48% think there is no significant influence on the environment. 46% think the proposed project can improve the local ecological environment and 54% think it has no impacts on the ecological environment. 98% of the interviewees are satisfied with the methods proposed to alleviate the environment impacts and 2% have no idea about it.

96% think the proposed project can promote local economic development, and 2% think it have no significant impact. 96% of them think the proposed project can supply more employment opportunities, 2% think it can not and 2% have no idea.

The outcome of the survey indicated that it is generally believed that the construction of the project will contribute to the local environment and to the development of local enterprises and improve the local employment situation. The participants said that they wish the project could be put into operation as soon as possible.By participating the meeting, all the participants had a better understanding of both the project and the CDM, and expressed their full support for the development of the project.

E.3. Report on consideration of comments received

>>

The residents and local government are all very supportive to the proposed project. No negative comments have been received on the project. However, there are few persons who express some concerns about noise. The project owner will take following measures to reduce the impacts: choosing the equipments with high efficiency and little noise, taking vibration reduction measures when fixing equipments, taking sound proof measures to the noisy equipments, to control the noise in the standard range.

Furthermore, the project owner also make a decision to further the project publication together with local government to eliminates that public concerns. And, the project owner will make best use of the CDM and facilitate the project construction. In the future project operation period, the project owner will keep good contact with the local stakeholders, and invite them to supervise their actions for environmental protection.

SECTION F. Approval and authorization

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Approval from China and Switzerland has been acquired

- - - - -

Appendix 1: Contact information of project participants

Organization name	Yueyang Kaidi Green Energy Development Co., Ltd.
Street/P.O. Box	T1 Jiangxia Avenue, Eastlake Newtech Development Zone
Building	Kaidi Building
City	Wuhan
State/Region	Hubei Province
Postcode	433300
Country	P.R. China.
Telephone	+86-27-87992876
Fax	+86-27-87992893
E-mail	Cdm_kaidi@yahoo.cn
Website	
Contact person	(Primary Signatory)
Title	Ms.
Salutation	
Last name	Hao
Middle name	
First name	Jing
Department	
Mobile	
Direct fax	+86-27-87992893
Direct tel.	+86-27-87992876
Personal e-mail	Cdm_kaidi@yahoo.cn

Organization name	Camco Carbon Limited
Street/P.O. Box	Green Street
Building	Channel House
City	St Helier
State/Region	Jersey
Postcode	JE2 4UH
Country	Channel Islands
Telephone	+44 (0)1534 834 618
Fax	+44 (0)1534 834 601
E-mail	
Website	www.camcoglobal.com
Contact person	(Primary Signatory)
Title	Mrs
Salutation	Qualification Director
Last name	Rawlins
Middle name	
First name	Madeleine
Department	
Mobile	
Direct fax	+86 10 8448 2432
Direct tel.	+86 10 8448 1623
Personal e-mail	Project.participant.cn@camcoglobal.com

Organization name	Camco International Limited
Street/P.O. Box	Green Street
Building	Channel House
City	St Helier
State/Region	Jersey
Postcode	JE2 4UH
Country	Channel Islands
Telephone	+44 (0)1534 834 618
Fax	+44 (0)1534 834 601
E-mail	
Website	www.camcoglobal.com
Contact person	(Primary Signatory)
Title	Mrs
Salutation	Qualification Director
Last name	Rawlins
Middle name	
First name	Madeleine
Department	
Mobile	
Direct fax	+86 10 8448 2432
Direct tel.	+86 10 8448 1623
Personal e-mail	Project.participant.cn@camcoglobal.com

Appendix 2: Affirmation regarding public funding

There is no public funding in the project activity.

Appendix 3: Applicability of selected methodology

The applicability of selected methodology is discussed in Section B.2 of the PDD.

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

According to the approved methodology ACM0002 and the document “China's Regional Grid Baseline Emission Factors Renewed”, released at http://cdm.ccchina.gov.cn/ on 30 December 2008, the $EF_{grid,CM,y}$, $EF_{grid,OM,y}$, and $EF_{grid,BM,y}$ of Central China Power Grid could be calculated as following:

A. Electricity Generation of Central China Power Grid (2002-2006)

Table A1. Electricity Generation of Central China Power Grid (2002-2006)

Year	Electricity Generation (Unit: 10^8 KWh)					Split of low-cost/must-run resources
	Total	Hydro	Thermal	nuclear	Others	
2002	3127.88	1124.40	2003.47	0	0	35.95%
2003	8345.05	3655.70	4689.35	0	0	43.81%
2004	4396.36	1665.89	2730.47	0	0	37.89%
2005	4964.30	1915.48	3048.25	0	0.57	38.60%
2006	5478.59	1922.96	3554.53	0	1.02	35.12%

Sources: China Electric Power Yearbook 2002-2007

B. Calculation of Operating Margin Emission Factor ($EF_{grid,OM,y}$)

Table B1. Electricity Generation of Central China PowerGrid in 2004

	Electricity generation of fuel-fired power plants (MWh)	Auxiliary power ratio (%)	Total Electricity Supplied to the Grid (MWh)
Jiangxi	30127000	7.04	28,006,059
Henan	109352000	8.19	100,396,071
Hubei	43034000	6.58	40,202,363
Hunan	37186000	7.47	34,408,206
Chongqing	16520000	11.06	14,692,888
Sichuan	34627000	9.41	31,368,599
Total			249,074,186

Sources: China Electric Power Yearbook 2005

Table B2. Electricity Generation of Central China Power Grid in 2005

	Electricity generation of fuel-fired power plants (MWh)	Auxiliary power ratio (%)	Total Electricity Supplied to the Grid (MWh)
Jiangxi	30000000	6.48	28,056,000
Henan	131590000	7.32	121,957,612
Hubei	47700000	2.51	46,502,730
Hunan	39900000	5	37,905,000
Chongqing	17584000	8.05	16,168,488
Sichuan	37202000	4.27	35,613,475

Total			286,203,305

Sources: China Electric Power Yearbook 2006

Table B3. Electricity Generation of Central China Power Grid in 2006

	Electricity generation of fuel-fired power plants (MWh)	**Auxiliary power ratio (%)**	**Total Electricity Supplied to the Grid (MWh)**
Jiangxi	34449000	6.17	32,323,497
Henan	151235000	7.06	140,557,809
Hubei	54841000	2.75	53,332,873
Hunan	46408000	4.95	44,110,804
Chongqing	23487000	8.45	21,502,349
Sichuan	44193000	4.51	42,199,896
Total			334,027,226

Sources: China Electric Power Yearbook 2007; China Energy Statistical Yearbook 2007

Table B4. Calculation of Operating Margin Emission Factor of Central China Power Grid in 2004

Fuel	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chong qing E	Sichuan F	Total G=A+ … +F	Emission Factor[1] (tC/TJ) H	Oxidation[2] (%) I	Average Low Caloric Value[3] (MJ/t or km^3) J	CO_2 Emission (tCO_2e) K=G*H*I*F*44/12/1000 (mass) K=G*H*I*F*44/12/1000 (Volume)
Raw Coal	10^4t	1863.8	6948.5	2510.5	2197.9	875.5	2747.9	**17144.1**	25.8	100	20908	339,092,605
Cleaned coal	10^4t		2.34					**2.34**	25.8	100	26344	58,316
Other Washed Coal	10^4t	48.93	104.22			89.72		**242.87**	25.8	100	8363	1,921,441
Coke	10^4t		109.61					**109.61**	29.2	100	28435	3,337,011
Coke Oven Gas	10^8m^3			1.68		0.34		**2.02**	12.1	100	16726	149,900
Other Gas	10^8m^3					2.61		**2.61**	12.1	100	5227	60,527
Crude Oil	10^4t		0.86	0.22				**1.08**	20	100	41816	33,118
Gasoline	10^4t		0.06			0.01		**0.07**	18.9	100	43070	2,089
Diesel Oil	10^4t	0.02	3.86	1.7	1.72	1.14		**8.44**	20.2	100	42652	266,627
Fuel Oil	10^4t	1.09	0.19	9.55	1.38	0.48	1.68	**14.37**	21.1	100	41816	464,893
PLG	10^4t							**0**	17.2	100	50179	0
Refinery Gas	10^4t	3.52	2.27					**5.79**	15.7	100	46055	153,506
Natural Gas	10^8m^3						2.27	**2.27**	15.3	100	38931	495,775
Other Petroleum Products	10^4t							**0**	20	100	38369	0
Other Coking Products	10^4t							**0**	25.8	100	28435	0
Other Energy	10^4t tce		16.92		15.2	20.95		**53.07**	0	100	0	0
												Total CO_2 Emission: 346,035,810
Total emission of the Central China Power Grid(tCO_2e)									**346,035,810**			
Fossil power supply of the Central China Power Grid(MWh)									**249,074,186**			
OM emission factor of the East China Power Grid(tCO_2e/MWh)									**1.38929**			

Sources: China Energy Statistical Yearbook 2005

2006 IPCC Guidelines for National Greenhouse Gas Inventories， Volume 2 Energy, chapter 1, page 1.21-1.24, table 1.3 and 1.4.

China Energy Statistical Yearbook 2007,Page 287

Table B5. Calculation of Operating Margin Emission Factor of Central China Power Grid in 2005

Fuel	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	Total G=A+ … +F	**Emission Factor**[1] (tC/TJ) H	**Oxidation**[2] (%) I	**Average Low Caloric Value**[3] (MJ/t or km^3) J	CO_2 Emission (tCO_2e) K=G*H*I*F*44/12/1000 (mass) K=G*H*I*F*44/12/1000 (Volume)
Raw Coal	10^4t	1869.29	7638.87	2732.15	1712.27	875.4	2999.77	**17827.75**	25.8	100	20908	352,614,497
Cleaned coal	10^4t	0.02						**0.02**	25.8	100	26344	498
Other Washed Coal	10^4t		138.12			89.99		**228.11**	25.8	100	8363	1,804,669
Coke	10^4t		25.95		105			**130.95**	29.2	100	28435	3,986,695
Coke Oven Gas	10^8m^3			1.15		0.36		**1.51**	12.1	100	16726	112,054
Other Gas	10^8m^3		10.2			3.12		**13.32**	12.1	100	5227	308,897
Crude Oil	10^4t		0.82	0.36				**1.18**	20	100	41816	36,185
Gasoline	10^4t		0.02			0.02		**0.04**	18.9	100	43070	1,194
Diesel Oil	10^4t	1.3	3.03	2.39	1.39	1.38		**9.49**	20.2	100	42652	299,798
Fuel Oil	10^4t	0.64	0.29	3.15	1.68	0.89	2.22	**8.87**	21.1	100	41816	286,959
PLG	10^4t							**0**	17.2	100	50179	0
Refinery Gas	10^4t	0.71	3.41	1.76	0.78			**6.66**	15.7	100	46055	176,572
Natural Gas	10^8m^3						3	**3**	15.3	100	38931	655,209
Other Petroleum Products	10^4t							**0**	20	100	38369	0
Other Coking Products	10^4t				1.5			**1.5**	25.8	100	28435	40,349
Other Energy	10^4t tce		2.88		1.74	32.8		**37.42**	0	100	0	0
									Total CO_2 Emission: 360,323,575			
Total emission of the Central China Power Grid(tCO_2e)									**360,323,575**			
Fossil power supply of the Central China Power Grid(MWh)									**286,203,305**			
OM emission factor of the East China Power Grid(tCO_2e/MWh)									**1.25898**			

Sources: China Electric Power Yearbook 2006

Table B6. Calculation of Operating Margin Emission Factor of Central China Power Grid in 2006

Fuel	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	Total G=A+ … +F	**Emission Factor**[1] (tC/TJ) H	**Oxidation**[2] (%) I	**Average Low Caloric Value**[3] (MJ/t or km^3) J	CO_2 Emission (tCO_2e) K=G*H*I*F*44/12/1000 (mass) K=G*H*I*F*44/12/1000 (Volume)
Raw Coal	10^4t	1926.02	8098.01	3179.79	2454.48	1184.3	3285.22	**20127.82**	25.8	100	20908	398,107,508
Cleaned coal	10^4t					5.79		**5.79**	25.8	100	26344	144,295
Other Washed Coal	10^4t	4.51	104.12		8.59	79.21		**196.43**	25.8	100	8363	1,554,036
Briquette							0.01	**0.01**	26.6	100	20908	204
Coke	10^4t		17.23		0.32			**17.55**	29.2	100	28435	534,299
Coke Oven Gas	10^8m^3		0.52	1.07	4.24	0.38	0.01	**6.22**	12.1	100	16726	461,572
Other Gas	10^8m^3	12.69	3.95		1.7	4.36	0.01	**22.71**	12.1	100	5227	526,655
Crude Oil	10^4t		0.49					**0.49**	20	100	41816	15,026
Gasoline	10^4t		0.01					**0.01**	18.9	100	43070	298
Diesel Oil	10^4t	0.91	2.23	1.41	1.78	0.96		**7.29**	20.2	100	42652	230,298
Fuel Oil	10^4t	0.51	1.26	1.31	0.8	0.57	3.49	**7.94**	21.1	100	41816	256,872
PLG	10^4t							**0**	17.2	100	50179	0
Refinery Gas	10^4t	0.86	8.1	1	0.97			**10.93**	15.7	100	46055	289,780
Natural Gas	10^8m^3			0.28		0.16	18.63	**19.07**	15.3	100	38931	4,164,943
Other Petroleum Products	10^4t							**0**	20	100	38369	0
Other Coking Products	10^4t						0.01	**0.01**	25.8	100	28435	269
Other Energy	10^4t tce	17.45	37.36	31.55	18.29	29.35		**134**	0	100	0	0
									Total CO_2 Emission: 406,286,055			
Net electricity imported from Northwest China Grid (MWh)									**3,028,950**			
The average emission factor of Northwest China Power Grid in 2006(tCO_2e/MWh)									**0.82214**			
Total emission of the Central China Power Grid(tCO_2e)									**408,776,270**			
Fossil power supply of the Central China Power Grid(MWh)									**337,056,176**			
OM emission factor of the East China Power Grid(tCO_2e/MWh)									**1.212784**			

Sources: China Electric Power Yearbook 2007; China Energy Statistic Yearbook 2007

Table B7. Weighted-average OM emission factor of Central China Power Grid (2004-2006)

	2004	2005	2006	Weighted-average OM emission factor
Total Emission, tCO2	346,035,810	360,323,575	408,776,270	
Total power supply, MWh	249,074,186	286,203,305	337,056,176	
OM emission factor, tCO2/MWh	1.38929	1.25898	1.212784	**1.27834**

Therefore, the $EF_{grid,OM,simple}$ could be calculated as:

$EF_{grid,OM,simple}$ =（346,035,810+ 360,323,575+408,776,270）/ (249,074,186+ 286,203,305+ 337,056,176) = **1.27834** tCO_2e/MWh

C． Calculation of the Build Margin Emission Factor ($EF_{grid,BM,y}$)

Table C1 Emission Factor of Best Technology

	Variable	Electricity supply efficiency	Emission factor of fuel (tC/TJ)	Oxidation rate	Emission factor (tCO_2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-based power plants	$EF_{Coal,Adv}$	37.28%	25.8	1	0.9135
Gas-based power plants	$EF_{Gas,Adv}$	48.81%	15.3	1	0.4138
Oil-based power plants	$EF_{Oil,Adv}$	48.81%	21.1	1	0.5706

Sources: China's grid baseline BM calculation progress, NRDC

Table C2 The Proportion Of CO_2 Emission From Solid、Liquid、Gas Fuel For Generating Electricity

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	Caloric	Emission	Oxidatio	Emis
		A	B	C	D	E	F	G=A+…+F	H (KJ/kg)	I	J	K=F*G*H*I*44/12/100
Raw Coal	10^4 t	1926.02	8098.01	3179.79	2454.48	1184.3	3285.22	20127.82	20908	25.8	1	398,107,508
Cleaned Coal	10^4 t	0	0	0	0	5.79	0	5.79	26344	25.8	1	144,295
Other Washed	10^4 t	4.51	104.12	0	8.59	79.21	0	196.43	8363	25.8	1	1,554,036
Briquette	10^4 t	0	0	0	0	0	0.01	0.01	20908	26.6	1	204
Coke	10^4 t	0	17.23	0	0.32	0	0	17.55	28435	29.2	1	534,299
Subtotal												**400,340,342**
Crude Oil	10^4 t	0	0.49	0	0	0	0	0.49	41816	20	1	15,026
Gasoline	10^4 t	0	0.01	0	0	0	0	0.01	43070	18.9	1	298
Kerosene	10^4 t	0	0	0	0	0	0	0	43070	19.6	1	0
Diesel Oil	10^4 t	0.91	2.23	1.41	1.78	0.96	0	7.29	42652	20.2	1	230,298
Fuel Oil	10^4 t	0.51	1.26	1.31	0.8	0.57	3.49	7.94	41816	21.1	1	256,872
Other Petroleum	10^4 t	0	0	0	0	0	0	0	38369	20	1	0
Other Coking	10^4 t	0	0	0	0	0	0.01	0.01	28435	25.8	1	269
Subtotal												**502,763**
Natural Gas	10^7 m^3	0	0	2.8	0	1.6	186.3	190.7	38931	15.3	1	4,164,943
Coke Oven Gas	10^7 m^3	0	5.2	10.7	42.4	3.8	0.1	62.2	16726	12.1	1	461,572
Other Gas	10^7 m^3	126.9	39.5	0	17	43.6	0.1	227.1	5227	12.1	1	526,655
PLG	10^4 t	0	0	0	0	0	0	0	50179	17.2	1	0
Refinery Gas	10^4 t	0.86	8.1	1	0.97	0	0	10.93	46055	15.7	1	289,780
Subtotal												**5,442,950**
Total												**406,286,055**

Sources: China Energy Statistical Yearbook 2007

Calculate with relevant data and formulae, the value for λ_{Coal} is 98.54%the value for λ_{Oil} is 0.12% and the value for λ_{Gas} is 1.34%.

Therefore,

$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ =0. 9064 tCO_2e/MWh.

Table C3 Installed capacity of the Central China Power Grid in 2006

Installed Capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
	M	6568	32603	11623	10715	5594	9555	76658
	M	3288	2553	8521	8648	1979	17730	42719
	M	0	0	0	0	0	0	0
Wind & Others	MW	0	0	0	17	24	0	41
	M	9856	35156	20144	19380	7597	27285	119418

Sources：China Electric Power Yearbook 2007

Table C4 Installed capacity of the Central China Power Grid in 2005

Installed Capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
	M	5906	26267.8	9526.3	7211.6	3759.5	7496	60167.2
	M	3019	2539.9	8088.9	7905.1	1892.7	14959.6	38405.2
	M	0	0	0	0	0	0	0
Wind & Others	MW	0	0	0	0	24	0	24
	M	8925	28807.7	17615.2	15116.7	5676.2	22455.6	98596.4

Sources：China Electric Power Yearbook 2006

Table C5 Installed capacity of the Central China Power Grid in 2004

Installed Capacity	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
	M	5496	21788.5	9590.3	6779.5	3271.1	6900.3	53825.7
	M	2549.9	2438	7415.1	7448.2	1407.9	13382.9	34642
	M	0	0	0	0	0	0	0
Wind & Others	MW	0	0	0	0	0	0	0
	M	8045.9	24226.5	17005.4	14227.7	4679	20283.2	88467.7

Sources：China Electric Power Yearbook 2005

Table C6. Calculation of BM Emission Factor of Central China Power Grid (2004-2006), MW

	New Capacity 2004	New Capacity 2005	New Capacity 2006	New Capacity 2005-2006	Percentage of New Capacity Additions

	A	B	C	D=C-A	
Fuel-fired (MW)	53825.7	60167.2	76658	22832.3	73.77%
Hydro (MW)	34642	38405.2	42719	8077	26.10%
Nuclear (MW)	0	0	0	0	0.00%
Wind(MW)	0	24	41	41	0.13%
Total	88467.7	98596.4	119483	30950.3	**100.00%**
Percentage of Year 2006	74.08%	82.56%	100%		

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} = 0.9064 \times 73.77\% = 0.6687 \ tCO_2/MWh$$

D．Calculation of the Baseline Emission Factor （$EF_{grid,CM,y}$）

$EF_{grid,CM,y}=0.5\times EF_{grid,OM,y} + 0.5\times EF_{grid,BM,y} = 0.5 \times 1.2783 + 0.5 \times 0.6687 = 0.9735\ tCO_2/MWh$

Appendix 5: Further background information on monitoring plan

No Supplement Information.

Appendix 6: Summary of post registration changes

The biomass types used by the proposed project has been changed from Rice husk, Rice straw, Oil seed rape straw, cotton straw, maize straw and wheat straw to Rice husk, Rice straw, maize straw, wood chips, branches and barks.

The name of manufacturer (NanJing Steam Turbine (Group) Co., Ltd) for generator in Table A-2 of registered PDD was mistyped as ‘ Nanjing Steam Turbine(Group) Co.,’, and it has been corrected in the updated PDD.

The average loading capacity of the trucks used to transport the biomass is changed from the estimated value of 3t in the registered PDD to the actual value of 10.7t.

The PDD was also revised in section A.4 to reflect that Camco International Limited was authorized by Switzerland to participate in this project. The request to also add Switzerland as Party involved in the project has been accepted by the UNFCCC in 2011.

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History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for CDM project activities" (EB 66, Annex 8).
03	EB 25, Annex 15 26 July 2006	
02	EB 14, Annex 06b 14 June 2004	
01	EB 05, Paragraph 12 03 August 2002	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		