



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

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**SECTION A. General description of project activity****A.1 Title of the project activity:**

Shandong Gaotang 30MW Biomass Power Generation Project

Version: 07

Date: 02/10/2011

Revision history of this document:

Version Number	Date	Description
01	20/11/2006	Internal Draft Version
02	20/01/2007	PDD submitted to DNA for LOA
03	10/04/2007	PDD submitted for GSP
04	22/07/2007	PDD revised to address DOE's comments based on the document review and on-site interview
05	24/09/2007	PDD submitted for registration request
06	25/01/2011	PDD prepared for notification and Request for Approval of Changes
07	02/10/2011	PDD revised addressing questions raised in completeness check

A.2. Description of the project activity:

The Shandong Gaotang 30MW Biomass Power Generation Project (hereafter referred to as the Project) is located in Gaotang County, Liaocheng City, Shandong Province, P.R.China. Gaotang County, with rich agricultural resources, is one of the biggest agriculture bases in the northwest of Shandong province. The implementation of the project will realize biomass comprehensive utilization in the province and serve as a demonstration project in China.

The project will utilize local surplus biomass residues (cotton straw, wood residues and wheat bran)¹ for generating electricity.

The install capacity is 30MW and the straw-fired boiler is imported from Denmark BWE Company, which is a world leading company in biomass boilers production and biomass cogeneration. The project will assist in transferring advanced biomass technology to China. It is estimated that the Project can deliver 187,626 MWh/y of electricity to the North China Grid, which consume nearly 247,506 tons biomass residues on wet base per year.

The technology of straw-fired power generation applied to the project is still at a nascent stage in China and involves much higher investment risks and lower financial attractiveness compared with the mature coal-fired power generating technology. In order to reduce the investment risks of the project, incentive

¹ The change of biomass type has no impact on application of the methodology and the scale of the project activity, please see section B.2 in this PDD for detail.



from the CDM was seriously considered by the project owner even in the planning phase². E.g., from the *Letter of Intention* given by local Gaotang County Government on 12 January 2006, it is demonstrated that local government encouraged the project owner to develop the project as CDM project. And at the first Board Meeting of National Bio Energy Gaotang Co., Ltd on 18 January 2006, all the members of the Board fully recognized the contribution of the CDM revenues to the financial attractiveness of the project and therefore agreed to develop the project as CDM project.

Then the project was approved by Shandong Development and Reformation Commission in June, 2006, and put into trial operation on 29 January 2007. The project is in full operation in 2008, which will help reduce GHG emissions from the high-growth, coal-dominated power generation of North China Grid. Moreover, the project used biomass residues(cotton straw, wood residues and wheat bran) for energy purpose in high efficiency, which will reduce CH₄ emissions because the biomass is dumped or left to decay or burned in an uncontrolled manner in the absence of the project. The estimated annual GHG emission reductions are 180,881tCO₂e.

The project adopts renewable cotton straw, wood residues and wheat bran as fuels, which will contribute to the sustainable development in the region as list in following aspects:

- By using biomass residues as fuels for power generation, saving the amount of coal use and making the biomass residues utilization in high efficiency, which will assist China in stimulating and accelerating the commercialization of grid-connected renewable energy technologies and markets in China.
- The ash as by-product of biomass residues burning can be used as ash fertilizer, which will amount to over 9,368 tons in one year.
- The project will improve the livelihoods of local people by creating employment opportunities, and promoting the local tourism industry.
- The project will facilitate the local relevant industry such as biomass residues purchase, transport and storage.
- The project will reduce GHG emissions compared to a business-as-usual scenario.

In a word, the project will contribute to the sustainable development in the region by reducing pollution, creating employment opportunities, promoting the local tourism industry and improving the livelihoods of local people.

The project was put into trial operation on 29 January 2007 and in full operation in 2008. The project was registered at UNFCCC on 20/03/3008. Two permanent changes occurred during the project actual implementation.

Change 1: Three types of biomass residues (Cotton stalk, Wood residues and Wheat Bran) have been applied to the project.

Before the project plant put into trial operation on 29 January 2007, the change 1 occurred, thus PO knew the change 1 prior to the registration of the project activity, but investor was not aware that the two changes would happen in the future when investment decision was made on 18 January 2006 because there is few referenced biomass projects and lacks of experience.

The reason for the added two types of biomass residues are:

² The CDM consideration evidences such as later-mentioned *Letter of Intention* on 12 January 2007 and the final decision report of the first Board Meeting on 18 January 2007 were supplied to DOE for verifying.



(1): According to registered PDD, the project will utilize local surplus biomass residues (mainly as cotton stalk) for generating electricity. In the project design stage, PPs can not decide which kind of biomass residues can also be a stable fuel source for the project apart from cotton stalk. During the actual project implementation, PPs found that only cotton stalk can not satisfy as stable fuel supply due to narrow harvest seasons in the whole year, and local abundant biomass residues are cotton stalk, wood residues and wheat bran, which have been finally identified and the boiler has ability of combusting these biomass fuels.

(2) Because I: NCV of biomass residues was assumed at a high value (15.89GJ/ton) as lacking experience in FSR, and the NCV in actual operation(13.71/14.66/11.87GJ/ton for cotton stalk, wood residues and wheat bran separately) were found to be lower; II: Actual moisture content of all the biomass residues(24.81%/31.17%/24.99% for cotton stalk, wood residues and wheat bran separately) were higher than that in the registered PDD(9.61%) as PPs could not collect ideal biomass residues which was out of PPs' control. So, the actual biomass fuel consumption was high and the total biomass consumption is re-calculated to be 247,506 tons per year according to operation records of the power plant in 2008/2009, which is 105% more than the value in registered PDD.

Change 2: Higher power generation.

When the final version(05) PDD submitted to EB on 24/09/2007, PPs did not know the change 2 because the project was put into trial operation only 8 months ago, the project was in full operation in 2008. After 1 year operation, PPs found that the operation hours is higher than 5500 hours in registered PDD and is re-calculated to be 7000 according to actual operation data.

The reason for the higher power generation:

- (1) Conservative operation hours 5500 hours was made in FSR because few referenced biomass projects in China and lacks of experience when finishing FSR in March 2006.
- (2) Good performance of boiler with advanced technology imported from Denmark BWE Company and sound onsite maintenance service to the power generation equipments.
- (3) As the "Biomass resource statistical reports" stated, the available cotton stalk, wood residues, wheat bran in local region around the project site is 228%, 168%, 202% more than the total biomass utilized separately. This stated that these abundant biomass residues enabled unconstrained operation of the boiler.

Conclusion:

The two changes occurred in implementation stage have no impact on scale of project activity and the applicability/application of the baseline methodology. The baseline scenario still remains the same as the registered PDD. And emission reduction method also remains the same as the registered PDD and ACM0006 versin04.

As for additionality: Although the 29.22%³ higher power exported than that in registered PDD, but the 105%⁴ increased biomass residues consumption lead to substantially increase on operation cost. The

³ 187626.39MWh was estimated to be power exported according to actual operation records. $(187626.39 - 145,200) / 145,200 = 29.22\%$.

⁴ $247,506$ tons biomass residues consumption was estimated to be power exported according to actual operation records. $(247,506 - 121000) / 121000 = 105\%$.



result showed that the 2 change will not alter the conclusion of additionality in the registered PDD. Please see section B.5 for detailed re-assessment and relevant data source.

A.3. Project participants:

Name of Party involved (*)(host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (host)	National Bio Energy Co., Ltd.	No
United Kingdom	EDF Trading Limited	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Please see Annex 1 for detailed contact information.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

People's Republic of China

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

Shandong Province

A.4.1.3. City/Town/Community etc:

Gaotang County, Liaocheng City

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

The project site is located in Gaotang Economic Development Zone, which is 5 kilometers to the northwest of Gaotang county seat .The Project has geographical coordinates with east longitude of 116°10'39" and north latitude of 36°54'36" . Geographical location of the project is shown in Figure A-1 and Figure A-2.



Figure A-1: Location of the Shandong Province in China



**Figure A-2: Location of the project****A.4.2. Category(ies) of project activity:**

Sectoral scope 1: energy industries (renewable sources)

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

The project has installed the Straw Direct Burning boiler of 130t/h with high temperature and high pressure, the equipment and advanced technology are imported from Denmark BWE Company, with burning completely and no knotting residue. This technology has been operated successfully in some European countries such as in Denmark, England and Germany. Key technical specifications of BWE boiler are listed as Table A-1 below.

Table A-1 Key Technical specifications of BWE boiler

Parameters Name	Unit	Value
boiler maximum continuous rating	t/h	130
Superheated Steam pressure	MPa	9.2
Superheated Steam temperature	°C	540
Boiler feed-water temperature	°C	210
Boiler Exhaust Temperature	°C	130°C
Boiler Efficiency	%	≥92
Boiler Dirt-discharge Rate	%	2%

Other two key equipments are turbine and generator, technologies of which are all developed by domestic manufacturers. Key technical specifications of turbine and generator are listed as Table A-2 and Table A-3 respectively.

Table A-2 Key technical specifications of turbine

Parameters Name	Unit	Data
Model	/	N30-8.83/535
Rated Output	MW	30
Rated Rotation Speed	r/min	3000
Rated Flow	t/h	120
Rated Pressure	MPa	8.83
Rated Temperature	°C	535

Table A-3 Key technical specifications of Generator

Parameters Name	Unit	Data
Model	/	QF-30-2
Rated Output	MW	30
Rated Voltage	kV	6.3
Rated Electric Current	A	3473
Rated Rotation Speed	r/min	3000

Fuel supply system is another very important technical system of the project. In order to guarantee the fuel supply of the project, seven individual biomass residues collection stations around the project site and one large biomass residues collection station at the project site have been constructed. The farmers



sell their cotton straw, wood residues and wheat bran in the nearest biomass residues collection, which will be cut into pieces, bundled regularly and transported to one large biomass residues collection station (Guguantun station) at the project site. The names of 7 individual biomass residues collection stations and their distances to the project are listed in following Table A-4.

Table A-4 Information of 7 individual stalk collection stations

Station Num	Station Name	Transportation Distance to the Project Site (km)
1	Liangcun	11
2	Tianzai	25
3	Dongzhuang	28
4	Fengzhuang	24
5	Liulishi	34
6	Wangxianzhuang	28
7	Liuzhenzhuang	29

The transportation of the biomass residues from the individual biomass residues collection stations to the large biomass residues collection station at the project site was sub-contracted by the project entity, with a local logistics firm named as Gaotang Third Transportation Co., Ltd. At the project site the fuel is unloaded in a receiver bunker and is stored in a large storage building which can accommodate approximately a biomass amount for 5-7 days of burning, and from there it is automatically reclaimed and transported to two small buffer silos in the boiler building.

The implementation of the project will facilitate the technology transfer from developed countries to China.

No change in the section 4.3, the technology and equipments are the same as registered PDD.

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

The project was successfully registered on UNFCCC on 20/03/2008.

The project activity is expected to generate an estimated annual emission reduction of 180,881 tCO₂ and 1,266,167 tCO₂ during the first crediting period of the project (20/03/2008-19/03/2015).

Year	Annual estimation of emission reductions(tCO ₂)
20/03/2008-19/03/2009	180,881
20/03/2009-19/03/2010	180,881
20/03/2010-19/03/2011	180,881
20/03/2011-19/03/2012	180,881
20/03/2012-19/03/2013	180,881
20/03/2013-19/03/2014	180,881
20/03/2014-19/03/2015	180,881
Total estimated reductions(tCO ₂) during the first crediting period	1,266,167
Total number of crediting years	7



Annual average of estimated reductions over the crediting period(tCO ₂)	180,881
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A.4.5. Public funding of the project activity:

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

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

The approved baseline and monitoring methodology applied in the project activity is ACM0006 Version 04–“Consolidated methodology for grid-connected electricity generation from biomass residues”.

In line with the application of the ACM0006 methodology the project refers to the following tools and methodology:

ACM0002: “Consolidated baseline and monitoring methodology for grid-connected electricity generation from renewable sources” and conjunction with the approved monitoring methodology (Version 06)⁵

Version 03 of the tool for demonstration and assessment of additionality¹

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

The approved baseline and monitoring methodology ACM0006 “Consolidated methodology for grid-connected electricity generation from biomass residues” are applicable to grid-connected and biomass residue fired electricity generation project activities, including cogeneration plants.

The methodology is applicable under the following conditions:

- No other biomass types than biomass residues, as defined above, 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);
- For projects that use biomass residues from a production process (e.g. production of sugar or wood panel boards), the implementation of the project shall not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other substantial changes (e.g. product change) in this process;
- The biomass residues used by the project facility should not be stored for 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 combustion (e.g. esterification of waste oils) are not eligible under this methodology.

The project is a new biomass residue fired power generation plant, which meets all above-mentioned applicability conditions of methodology ACM0006 because:

⁵ <http://cdm.unfccc.int/methodologies/approved>



- Predominant fuels used by the project are cotton stalk, wood residues, wheat bran, and no other type of biomass was used in the power plant, this can be validated in the detailed biomass residues purchase records (cotton stalk, wood residues, and wheat bran). All these files have been archived for CDM validation and verification stage;
- The cotton stalk used by the project are by-products of agriculture crops, not from a production process; the biomass residues wood residues is collected from local woodwork factories through wholesalers and retailers; residues wheat bran combusted in the power plant came from one supplier-Shandong Quanlin Paper factory, For wholesaler Gaotang County wood plate process company, Gaotang County Qingyuan Biomass Fuel Co.Ltd, 63 retailers, and Shandong Quanlin Paper factory have provided statement to prove that all the wood residues and wheat bran supplied by them are the biomass residues and do not result in any increase of processing capacity of raw input or in other substantial changes in the wood plate production process;
- The store time of the three types of biomass residues used for power plant are all shorter than half a year⁶ ;
- In order to guarantee the biomass supply of the project, seven small collection stations around the project site and one large biomass residue collection station named Guguantun aside the project site were constructed. The suppliers transport the biomass residues to the nearest collection stations. In the collection stations, the biomass residues will be cut into pieces, bundled and transported to Guguantun collection station aside the project site. The transportation of the biomass residues s from the individual biomass fuel collection stations to Guguantun collection station was sub-contracted by the project entity, with a logistics firm named as Gaotang Third Transportation Co., Ltd. Therefore, except from transportation and the mechanical treatment for biomass residues, the project has no significant consumption of fossil fuels and electricity. The electricity used in this process is not significant and has been added in the revised monitoring plan.

Therefore, the approved consolidated baseline methodology, ACM0006 are applicable to the project.

Conclusion: By apply three biomass residues, the project still in line with methodology ACM0006, version04, changes in the implementation of the project activity do not have influence on the applicability of baseline methodology.

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

According to the version 04 of ACM0006, the project boundary encompasses the power plant at the project site, the means for transportation of biomass to the project site, and all power plants connected physically to North China Power Grid that the project connected to. This is in line with the default definition of the boundary given in the baseline methodology ACM0002, which is used for determining the emissions associated with grid electricity generation. The project is connected to North China Power Grid.

In this PDD, CH₄ emissions will be included for both project and baseline emissions. According to

⁶ Inventory table for biomass residues have been sent to audit team.



ACM0006, the GHGs included or excluded from the project boundary are listed as follows:

Table B-1 GHGs source included or excluded from the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity generation in fossil fuel fired power that is dispatched due to the project activity	CO ₂	Yes	Main emission source
		CH ₄	No	Excluded for simplification. This is conservative.
		N ₂ O	No	Excluded for simplification. This is conservative.
	Uncontrolled burning or decay of Surplus biomass	CO ₂	No	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	Yes	B1 is the most likely baseline scenario.
		N ₂ O	No	Excluded for simplification. This is conservative.
Project Activity	On-site fossil fuel and electricity consumption due to the project activity (stationary or mobile)	CO ₂	Yes	May be an important emission source
		CH ₄	No	Excluded for simplification. This emission source is assumed to be very small.
		N ₂ O	No	Excluded for simplification. This emission source is assumed to be very small.
	Off-site transportation of biomass residues	CO ₂	Yes	Included as emission sources by project activity
		CH ₄	No	Excluded for simplification. This emission source is assumed to be very small.
		N ₂ O	No	Excluded for simplification. This emission source is assumed to be small.
	Combustion of biomass residues for electricity and / or heat generation	CO ₂	No	It is assumed that CO ₂ emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.
		CH ₄	Yes	CH ₄ emissions will be caused during the course of power/heat generation.
		N ₂ O	No	Excluded for simplification. This emission source is assumed to be small
	Biomass storage	CO ₂	No	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	No	Excluded for simplification. Since biomass residues are stored for not longer than one year, this emission source is assumed to be small.



		N ₂ O	No	Excluded for simplification. This emissions source is assumed to be very small.
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Conclusion: As a result of the implementation of project activity the greenhouse gases emission source in the project boundary still remain the same as the registered PDD.

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

According to the description in the approved baseline methodology ACM0006, 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; and
- in case of cogeneration projects: how the **heat** would be generated in the absence of the project activity.

The reasonable and feasible baseline scenarios of the project are identified below from three parts mentioned above-mentioned.

1. Power generation

In order to determine the most plausible baseline scenario for power generation, detailed analyses are summarized in Table B-2:

Table B-2 Identifying the most plausible baseline scenario for power generation

Series	Alternative	Included?	Justification/Explanation
P1	The proposed project activity not undertaken as a CDM project activity	Yes	It seems to be a plausible alternative without considering the investment barriers.
P2	The proposed project activity (installation of a power plant), fired with the same type of biomass residues but with a lower efficiency of electrical generation.(e.g. an efficiency that is common practice in the relevant industry sector)	No	At present, the technology of biomass power generation just starts, even if the biomass power plants with lower power generation efficiency are not common practice in China. Therefore, Alternative P2 can't become the most realistic baseline alternative for power generation.
P3	The generation of power in an existing plant, on-site or nearby the project site, using only fossil fuels	No	There are none of fossil fuel fired power plants on-site or nearby the project site, so P3 is excluded.
P4	The generation of power in existing and/or new grid-connected power plants	Yes	The generation of power from North China Grid will meet the requirement of national laws and regulations, also financially viable. Hence, the Alternative P4 is a feasible alternative.
P5	The continuation of power generation in an existing power plant, fired with the same type of biomass residues as (co-)fired in the	No	There are none of biomass power plants in the local areas, so P5 is excluded.



	project activity, and implementation of the project activity, not undertaken as a CDM project activity, at the end of the lifetime of the existing plant		
P6	The continuation of power generation in an existing power plant, fired with the same type of biomass residues as (co-)fired in the project activity and, at the end of the lifetime of the existing plant ,replacement of that plant by a similar new plant	No	There are none of biomass power plants in the local areas, so P6 is excluded.

As analyzed above, Alternative P1 and Alternative P4 are considered as plausible baseline scenarios. However, according the benchmark analysis in the latter step, the proposed project activity not undertaken as a CDM project activity will be faced with investment barriers and technological barriers and can't be run commercially, So P1 has to be excluded. Therefore, the most plausible baseline scenario for power generation is the Alternative P4.

2. Use of biomass

According to ACM0006 version 04, “where the project activity uses different types of biomass residues, the baseline scenario should be identified for each type of biomass residue separately”, so PPs have re-identified the baseline scenario for use of the three biomass residues separately.

Usage of biomass fuel in baseline scenario

Biomass type	Amount tons(wet base)	Usage in the baseline scenario
cotton stalk	90,215	Be dumped and decay in the natural fields with mainly aerobic conditions, or combusted in uncontrolled manner without utilizing it for energy purposes
wood residues	140,630	Be dumped and decay in the natural fields with mainly aerobic conditions
wheat bran	16,661	Be dumped and decay in the natural fields with mainly aerobic conditions

The project mainly uses biomass residues: cotton stalk, wood residues and wheat bran for power generation, without the project activity, the baseline scenario is that a huge amount of cotton stalk is left in the field to natural decay or burnt in an uncontrolled manner; all of the wood residues and wheat bran combusted in the power plant are left in the field to natural decay.

Detailed analyses on each alternative for each type of biomass residues are summarized in following table:



Table B-3 Identifying the most plausible baseline scenario for biomass use

Series	Alternative	Included?	Justification/Explanation
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	<p>Cotton stalk: Around the site of the project, cotton stalk is a main crop in local area, after harvest season, except little amount of cotton stalk was used as fertilizer or feedstock, but according to the “Biomass resource statistical reports”, 79% of the cotton stalk was dumped or left to decay in the natural fields with mainly aerobic conditions, or combusted in uncontrolled manner without utilizing it for energy purposes, which is common sense in countryside of contemporary China.</p> <p>Wood residues: the wood residues are fragmented waste from final stage of wood plate production processing in local factories, and all of the suppliers stated⁷ that these wood residues can not be fed into any process and there is no disposing mode for these wood residues, so, it would be dumped or left to decay if not transported to Gaotang power plant.</p> <p>Wheat bran: All of the residues wheat bran combusted in the power plant came from one supplier-Shandong Quanlin Paper factory, which has provided statement⁸ to prove that all the wheat bran supplied by them is the biomass residues from paper-making process and do not result in any increase of processing capacity of raw input or in other substantial changes in the paper production process, the residues wheat bran can not be fed into any process and there is no disposing mode for these wheat bran, so, it would be dumped or left to decay if not transported to Gaotang power plant.</p> <p>As analysis above, Alternative B1 is a realistic baseline alternative for unused cotton stalk, wood residues, wheat bran separately.</p>
B2	The biomass residues are dumped or left to decay under clearly anaerobic conditions.	No	Cotton stalk: The entire cotton stalk comes from country site and there is no disposing model with

⁷ Statements from Gaotang County wood plate process company, Gaotang County Qingyuan Biomass Fuel Co.Ltd, and 63 retailers have been provided to the audit team.

⁸ Statements from Shandong Quanlin Paper factory has been provided to the audit team.



	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.		<p>clearly anaerobic conditions.</p> <p>Wood residues and wheat bran: All of the wood residues and wheat bran combusted in the power plant are supplied by Gaotang County wood plate process company, Gaotang County Qingyuan Biomass Fuel Co.Ltd, 63 retailers, and Shandong Quanlin Paper factory. All of the suppliers stated that there is no disposing mode for these residues, so, it is obviously that there is no opportunity for the suppliers to dump or decay these wood residues and wheat bran under clearly anaerobic conditions.</p> <p>Therefore, B2 is excluded for cotton stalk, wood residues, and wheat bran separately</p>
B3	The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes.	Yes	<p>Cotton stalk: As the justification/explanation on scenario B1 for cotton stalk above, 79% of the cotton stalk was dumped or left to decay in the natural fields with mainly aerobic conditions, or combusted in uncontrolled manner without utilizing it for energy purposes, which is common sense in countryside of contemporary China.</p> <p>Therefore, Alternative B3 is one realistic baseline alternative for unused cotton stalk,</p> <p>Wood residues and wheat bran: As the justification/explanation on scenario B2 for wood residues and wheat bran, all of the suppliers stated that there is no disposing mode for these residues and these residues would be would be dumped or left to decay if not transported to Gaotang power plant.</p> <p>Therefore, Alternative B3 is excluded off baseline alternative for unused wood residues and wheat bran separately.</p>
B4	The biomass residues are used for heat and/or electricity generation at the project site	No	<p>The proposed project is a newly constructed project and is the only power plant that combust local unused cotton stalk, wood residues and wheat bran.</p> <p>So, in baseline scenario, these biomass residues are not used for heat and/or electricity generation at the project site.</p> <p>Therefore, B4 is excluded for the three types of biomass residues separately.</p>
B5	The biomass residues are used	No	There is no generation or cogeneration project



	for power generation, including cogeneration, in other existing or new grid connected power plants		<p>using cotton stalk, wood residues, wheat bran as fuel close to the project. Considering the cost of biomass transportation, other existing or new grid connected power plants will not use these surplus cotton stalk, wood residues, wheat bran.</p> <p>Therefore, B5 is excluded for the three types of biomass residues separately.</p>
B6	The biomass residues are used for heat generation in other existing or new boilers at other sites	No	<p>There is no biomass boiler using cotton stalk, wood residues, wheat bran as fuel close to the project. Considering the cost of biomass transportation, other existing or new boilers at other places will not use these surplus cotton stalk, wood residues, wheat bran.</p> <p>So alternative B6 is not a realistic baseline alternative for the unused three types of biomass residues separately.</p>
B7	The biomass residues are used for other energy purposes, such as the generation of bio-fuels	No	<p>Cotton stalk: According to the “Biomass resource statistical reports”, except little amount of cotton stalk was used as fertilizer or feedstock, huge amount (79%) of the cotton stalk was dumped or left to decay in the natural fields with mainly aerobic conditions, or combusted in uncontrolled manner without utilizing it for energy purposes.</p> <p>Further more, technology of bio-fuels production from cotton stalk did not existed/spread in local area.</p> <p>Therefore, B7 is excluded for cotton stalk.</p> <p>Wood residues and wheat bran: There is no other energy generation project that has needs to the surplus wood residues and wheat bran consumed by the project.</p> <p>Therefore, B7 is excluded for wood residues and wheat bran separately.</p>
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	<p>Cotton stalk: According to the “Biomass resource statistical reports”, except little amount of cotton stalk was used as fertilizer or feedstock, there are still a huge amount(79%) of the cotton stalk was dumped or left to decay in the natural fields with mainly aerobic conditions, or combusted in uncontrolled manner without utilizing it for energy purposes.</p>



			<p>Wood residues and wheat bran: As the justification/explanation on scenario B2 for wood residues and wheat bran, all of the suppliers stated that there is no disposing mode for these residues and these residues would be would be dumped or left to decay if not transported to Gaotang power plant.</p> <p>So alternative B8 is excluded for the three types of biomass residues separately.</p>
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As analyzed above, the most realistic and credible alternative for use of cotton stalk, wood residues, wheat bran all belong to B1 and/or B3.

3. Heat generation

The project is not a cogeneration projects and then dose not generates heat, so alternatives of heat generation are not considered.

In conclusion, the scenario 2 is the most realistic baseline scenario (Table B-4).

Table B-4 Baseline Scenario

Scenario	Project Type	Baseline Scenario		
		Power Generation	Use of biomass	Heat Generation
2	Power Greenfield Project	P4	B1 and B3 for cotton stalk	No Heat
B1 for wood residues				
B1 for wheat bran				

Conclusion: As analysis above, baseline scenarios for the use of three biomass residues have been identified separately and all of the three types of biomass residues (cotton stalk, wood residues, wheat bran) can claim the baseline emissions due to natural decay or uncontrolled burning of anthropogenic source of biomass residues.

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

The project uses the *Tool for the Demonstration and Assessment of Additionality* (version 3), which was revised in the EB 29, to demonstrate its additionality. The tool includes the following steps:

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

Define realistic and credible alternatives to the project activity(s) that can be (part of) the baseline scenario through the following sub-steps:

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



In the “Identification of the baseline scenario” of ACM0006, 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; and
- in case of cogeneration projects: how the **heat** would be generated in the absence of the project activity.

Detailed description of each alternative above-mentioned are carried out in Section B.4.

As it is discussed in Section B.4, the plausible baseline scenario for power generation is the alternative P1 (The project activity not undertaken as a CDM project activity) and P4 (Supply of equivalent power generation by the North China Grid); the plausible baseline scenario for unused biomass residues is the Alternative B1 (biomass residues are dumped or left to decay) and Alternative B3 (biomass residues are burnt in an uncontrolled manner).

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

As for power generation, P1 (The project activity not undertaken as a CDM project activity) and P4 (Supply of equivalent power generation by the North China Grid), are consistent with related laws and regulations in China.

As for biomass use, related policies and regulations have been issued, such as *Renewable Energy Promotion Law and Renewable Energy*. But currently there are no related regulations that compel to use biomass. Biomass residues has been dumped or left to decay or burned in an uncontrolled manner are ubiquitous both in China and near the project site. Therefore, B1 or B3 is a common scenario in the real world.

According to *Tool for the Demonstration and Assessment of Additionality*, if the project activity is the only alternative amongst the ones considered by the project participants that is in compliance with all regulations with which there is general compliance, then the proposed CDM project activity is not additional. Based on the above analysis, besides baseline scenario, most of alternatives are in line with the existing Chinese laws and regulations although some of them are excluded from baseline scenario with reasonable explanations in Section B.4; the project activity is not the only alternative amongst the ones identified that is in compliance with legal and regulatory requirements. Therefore, the proposed CDM project activity may be additional. The further analysis of project will be further demonstrated in latter step.

Step 2. Investment Analysis

The purpose of investment analysis is to determine whether the project activity is economically or financially less attractive than other alternatives without the revenue from the sale of certified emission reductions (CERs). To conduct the investment analysis, use the following sub-steps:

Sub-step 2a. Determine appropriate analysis method

The *Tools for the Demonstration and Assessment of Additionality* recommends three analysis methods, including simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).



The project generates financial and economic benefits through the sales of electricity other than CDM related income therefore the simple cost analysis (Option I) cannot be taken. And the investment comparison analysis (Option II) is only applicable to projects where alternatives should be similar investment projects. The alternative baseline scenario of power generation the project is the North China Grid rather than a new investment project. Out of the investment comparison analysis (Option II) and the benchmark analysis (Option III) shall be chosen.

Sub-step 2b. Option III. Apply benchmark Analysis

In accordance with *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects* issued by former State Power Corporation of China, there is not yet such a financial internal rate of return (IRR) as benchmark in China's power generation industry to date. However, the project IRR shall not be lower than 8 percent considering economic assessments of hydropower projects, fossil fuel fired projects, transmission and substation projects, especially the interest rate of commercial loans over five years⁹. Nowadays many of China's existing power projects have applied it as the benchmark IRR.

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

1) Parameters needed for calculation of key financial indicators

There are two changes between the registered PDD and the actual operation status: the total estimated power generation by the project is increased to 187,626 MWh/year (Original PDD:165,000MWh* (1-12%) =145,200 MWh/y) which lead to an increase in sales revenues and total biomass consumption in this project has been re-estimated to be 247,506 tons (original PDD121,000 tons), which lead to substantially increase on operation cost.

The result showed that the 2 change will not alter the conclusion of additionality in the registered PDD. Please see following sections for detailed re-assessment and relevant data source.

Estimated power exported has been increased by 29.22%, so PO re-calculated the financial indicators of the power plant bellow with these two changed key parameters considering guidelines provided by Annex 66/67, EB48¹⁰.

Parameters needed for calculation of key financial indicators are as follows:

Table B-5 Parameters for calculation of key financial indicators compared with registered PDD.

Series	Account Title	Unit	Data in registered PDD and actual situation	Data Sources
1	Capacity	MW	30	FSR
2	Construction Period	Year	1	FSR
3	Operation Life	Year	20	FSR

⁹ State Power Corporation of China. *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*. Beijing: China Electric Power Press, 2003

¹⁰ Paragraph 8 of Annex 66/67, EB48: "The re-assessment of additionality shall be based on all original input data, thereby – in case of investment analysis – in principle only modifying the changed key parameters in the original spreadsheet calculations".



4	Total Investment Capital Assets	1000RMB	29,0960	FSR
5	Gross Annual Electricity Generated	GWh	165/210	FSR/Estimated according to actual operation record of 2008/2009 and electricity generation plan of NBE
6	Electricity Consumption Rate for power generation	%	12.0/10.6541	FSR/Actual operation record of 2008
7	Depreciation Period	Year	15	FSR
8	Repair	%	2.50	FSR
9	Insurance	%	0.25	FSR
10	Average Personal Pay	RMB/year	30,000	FSR
11	Welfare Rate	%	60.5	FSR
12	Accumulation fund	%	10	FSR
13	commonweal fund	%	5	FSR
14	Biomass Residues Consumption for Electricity	kg/MWh	702.35 /1178.6	FSR/Actual operation record of 2008 monitored by automatic weighting software.
15	Price of Biomass Residues	RMB/ton	280	Footnote ¹¹
16	Feed-in-Tariff (including VAT, from 1 st to 15 th year)	RMB/MWh	594	Footnote ¹²
17	Feed-in-Tariff (including VAT, from 16 th to 20 th year)	RMB/MWh	344	Footnote ¹⁰
18	Water Fee	RMB/MWh	4.5	FSR
19	Average Material Fee	RMB/MWh	6	FSR
20	Other Fee	RMB/MWh	8	FSR
21	Persons	Person	50	FSR
22	Income Tax	%	33	FSR
23	Value Added Tax	%	17	FSR
24	City maintenance& Construction tax	%	7	FSR
25	Education addition Fee	%	4	FSR

¹¹ Because of that the financial conclusion still remained valid under the actual calculated biomass price 283.28 RMB Yuan/ton including VAT, PPs decided to adopt the biomass price of cotton stalk in registered PDD 280 RMB Yuan/ton including VAT in re-assessment of additionality and notification PDD V07.

¹² According to Clause 7 of the *Tentative Management Measures for Price and Sharing of Expenses for Electricity Generation from Renewable Energy* (Document No. NDRC Energy [2006]7), “the feed-in-tariff of biomass power generation project is decided by the government. Price administration agency of the State Council will stipulate region-specific benchmark tariff, and tariff standards will be composed of the benchmark tariff for the desulphurized coal-fired generator of various provinces (autonomous regions, municipalities directly under the Central Government) in 2005 and the subsidized tariff. The standard subsidized tariff is 0.25 RMB/kWh. Beginning from the date when the power generation project is put into operation, subsidized tariff can be continued for 15 years, and after that the subsidized tariff will be cancelled.”

The benchmark feed-in-tariff (including VAT) for the desulphurized coal-fired generator of Shandong Province in 2005 is 0.344 RMB/kWh¹² (Notification by Shandong NDRC and Shandong Price Administration Agency on implementing coal and electricity price linkage mechanism in Shandong Province, Document No. Lu Jia Ge Fa[2005]72). Thus the feed-in-tariff of the project in first 15 years calculated as 0.594 RMB/kWh (0.344+0.25).



26	Currency exchange rate (Euro:RMB)	RMB/Euro	10	Currency Rate
27	CERs price	Euro/tCO ₂ e	7	Expected

2) Comparison of IRR for the project and the financial benchmark

In accordance with benchmark analysis (Option III), if the financial indicators of the project, such as the project IRR¹³, are lower than the benchmark, the project is not considered to be financially attractive.

Table B-6 shows the project IRR of the project with and without the sales of CERs. Without the sales of CERs the project IRR is 4.46 percent which is lower than the financial benchmark. Thus the project is not considered to be financially attractive.

However, taking into account the CDM revenues, the project IRR is 9.93 percent, which is higher than the financial benchmark. Therefore the CDM revenues enable the project to overcome the investment barrier and demonstrate the additionality of the project.

Table B-6 Project IRR of the project

	Project IRR
Without CERs	4.46%
With CERs	9.93%

Sub-step 2d. Sensitivity analysis

The sensitivity analysis shall show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. For the project, four parameters were selected as sensitive factors to check out the financial attractiveness:

- 1) Total Investment for Capital Assets
- 2) Annual Electricity Generated
- 3) Annual O&M cost (excluding fuel cost)
- 4) Cotton Stalk Price

The results of sensitive analysis are shown in Table B-7 and Figure B-1 below.

Table B-7 Sensibility analysis of the project

	-10%	-5%	0%	5%	10%
Total investment	6.52%	5.46%	4.46%	3.51%	2.61%
Annual Electricity Generated	2.27%	3.39%	4.46%	5.48%	6.45%
Annual O&M cost	5.29%	4.88%	4.46%	4.02%	3.57%
Cotton Stalk Price	6.42%	5.47%	4.46%	3.36%	2.16%

¹³ For the benchmark analysis, the IRR shall be calculated as project IRR.

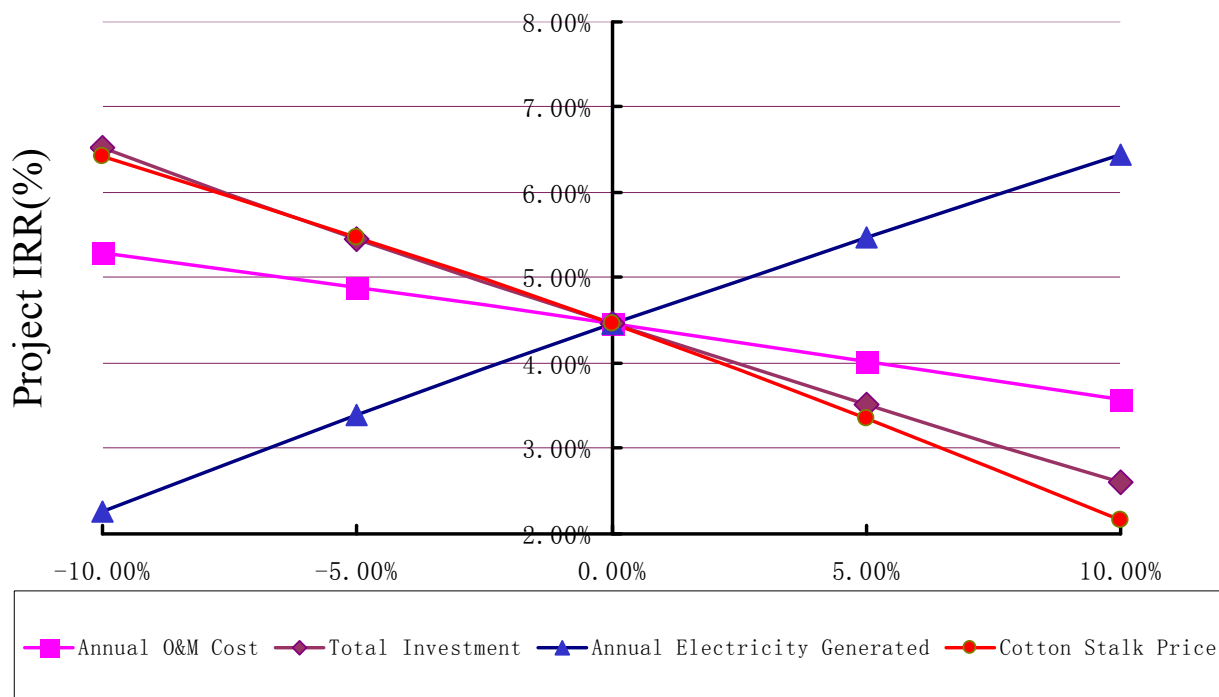


Figure B-1 Sensibility analysis of the proposed project

The project IRR of the project varies to different degrees in accordance with the fluctuation of four parameters within the range of negative 10 percent to positive 10 percent. It could be seen that the project IRR is below the benchmark IRR even when the total investment drops by 10 percent

To conclude, the sensitivity analysis shows that without CER revenue, IRR of the project is difficult to reach the benchmark 8%, which supports the conclusion that the project is unlikely to be financially attractive.

PP also does sensitivity analysis under actual operation situation here to examine whether the conclusion of financially attractive still exists when the key assumptions change reasonably. If the investment analysis could provide efficient arguments that the project has additionality, under the situation that the key assumption changes in a reasonable range, the result of analysis result will necessary support the following conclusion: the project activity is still not possible to be an attractive one financially under actual operation.

For this project, the following 3¹⁴ indicators will be used as uncertain factors to make sensitivity analysis of financial attraction:

- 1) Annual Electricity Generated
- 2) Operating Costs

¹⁴ Note that there is no need to analyse the impact of total investment because the investment was completed prior to the commercial operation.

3) Biomass Price¹⁵

With the assumption that the 3 indicators vary in the range of -10%~+10%, the corresponding results of project IRR are all far lower than the benchmark¹⁶.

Conclusion: Although the 29.22%¹⁷ higher power exported than that in registered PDD, which lead to 29.22%¹⁸ increase in sales revenues, but the 105%¹⁹ increased biomass residues consumption lead to 77.54%²⁰ increase on operation cost. The result showed that the re-assessed IRR is still much lower than that in registered PDD considering the two changes' impact on financial analysis. So, the two changes will not alter the conclusion of additionality in the registered PDD.

Furthermore, with the CERs revenues, the project IRR is 2.98%, which is still lower than the financial benchmark. Project owner need CERs revenue to improve poor financial situation.

Step 3. Barrier analysis

This step is used to determine whether the project activity faces barriers that:

- (a) Prevent the implementation of this type of project activity; and
- (b) Do not prevent the implementation of at least one of the alternatives.

Use the following sub-steps:

Sub-step 3a. Identify barriers that would prevent the implementation of type of the project activity

Establish that there are barriers that would prevent the implementation of the type of project activity from being carried out if the project activity was not registered as a CDM activity. Such barriers may include, among others:

Cost Disadvantage Barrier

¹⁵ Prices for each type of biomass residues are turbulent due to different seasons/moisture content/NCV/sources, and this is out of PO's control, so, it is not representative to select a price of some batches in re-assessment of additionality. PO has selected a more accurate and logical price- the average biomass price calculated from biomass purchase records in 2008 and 2009, which is provided by financial department of PO. The average biomass price (including VAT) in 2008/2009, which is the starting years of the full operation status, is 283.28 RMB Yuan/ton including VAT, which is just a little higher than that of price for cotton stalk adopt in registered PDD(280 RMB Yuan/ton including VAT). Because of that the financial conclusion still remained valid under the actual calculated biomass price 283.28 RMB Yuan/ton including VAT, PPs decided to adopt the biomass price of cotton stalk in registered PDD in re-assessment of additionality and notification PDD V07.

Please see "IRR comparison and Emission Reduction Calculation Spreadsheet" for detail calculation process.

¹⁶ Please see "IRR comparison and Emission Reduction Calculation Spreadsheet" for detail calculation process.

¹⁷ $187,626.39\text{MWh}$ was estimated to be power exported according to actual operation records. $(187,626.39-145,200)/145,200=29.22\%$.

¹⁸ Please see "IRR comparison and Emission Reduction Calculation Spreadsheet" for detail calculation process.

¹⁹ 247,506 tons biomass residues consumption was estimated to be power exported according to actual operation records. $(247,506-121,000)/121,000=105\%$.

²⁰ Please see "IRR comparison and Emission Reduction Calculation Spreadsheet" for detail calculation process.



In China the approximate investment costs of the biomass power generation project adopted direct burning technology is about 10,000 RMB/kW, which is nearly 4 times higher than that of the coal-fired power plant²¹. As far as this project is concerned, the investment cost is 9,939 RMB/kW because the direct burning boiler is imported from Denmark BWE Company. Therefore, developing the biomass cogeneration projects needs much more capital and revenue than those of same scale coal-fired power plant.

In addition, since biomass power generation is a relatively young technology comparing to the common fossil fuel power plants technology, the effects of combusting biomass fuels on the life cycle of the plant equipment are not yet established, which also increases the investment risks;

Without the CDM revenues, despite the prospective tariff policy and other incentives with respect to biomass power generation projects are currently in place, as mentioned in Step 2 financial indicators of this kind of projects have not fundamentally changed (IRR: 4.46%) and loan repayment capability remains weak, so the project would face financing barriers. However, with the CDM revenues, the indicator will be improved, and then investment/financing barriers can be overcome effectively.

Technology Barrier

Biomass power generation technology is still in the stage of research & development and project demonstration in China²², and there lacks particularly the self-developed and mature straw direct burning boiler technology, so the key technology adopted by the project is the biomass boiler imported from Denmark BWE Company.

With this imported technology, the project is possible to acquire higher efficiency and more advanced technology, but also bear technological risk. Since the technology of biomass cogeneration in China has not been commercialized, skilled and/or trained staffs are lacked to operate and maintain the facility, and there are no special education/training institutions in China providing such training activities. At the same time, the project owner is lack of experiences to operation and maintenance, the there are many uncertain risks during the operation. The CDM revenue can be used as a guarantee fund for the operation and maintenance and technical staffs train thus enable the project to overcome the technological barriers.

Price risk for biomass residue

Due to the biomass distribution is relatively dispersed and the project sponsor has to collect household by household which will increase the collection cost. Most important, the dispersed small-scale peasant economy means it will be impossible to hedge the straw price though a long-term contract. The lack of price hedge mechanism will greatly increase the risk of biomass based power generation project, for example, after Shandong Shiliquan straw mix with coal generation project²³ is commissioning, and the straw price of the Shiliquan project has increased from 100 RMB/t to 400 RMB/t, which leads to the significant increase in the power generation cost of Shiliquan project²⁴. The project also purchases biomass residues from dispersed farmers and without a long-term contract to hedge the straw price thus the changes in straw price will also be a potential risk.

²¹ http://www.newenergy.org.cn/html/2006-10/20061027_12214.html

²² http://nyj.ndrc.gov.cn/zywx/t20060206_58771.htm, *Directive Catalogue on Renewable Industry Development*, Degree No. 2517 of NDRC Energy.

²³ Shandong Shiliquan straw mix with coal generation project is outside the project boundary of the project (it is nearly more than 250 kilometres from the project site).

²⁴ <http://www.newenergy.org.cn/html/2005-12/200517815.html>



Biomass collection & Storage barriers

Biomass resource is widely dispersed in small quantities in the project site. Therefore, the collection and transportation work of the huge amount of biomass materials to the project site or closest collection point becomes a constraint. Apart from this, the expense of collection and transportation charges will increase every year due to the increasing trend in the cost of labor and transportation cost;

Another big problem is the storage of biomass. Unlike the normal thermal power plant, biomass firing plant has to consume much higher quantity of fuel which is rather difficult to maintain in plant lifetime operation period. The characteristics of biomass fuels change quickly within very short period of time and the low bulk density (weight per unit volume) make it difficult to handle and store; in addition, Comparing with the coal firing, biomass has lower burning point which might cause fire easily while storage, so there existed high risks of fire.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the project activity)

As mentioned in Section B.4, the baseline scenario of the project is scenario 2 of ACM0006, so the whether the barriers identified above would prevent the implementation of the alternatives are carried out respectively as following:

Alternatives to power generation

In the absence of the project activities, the most plausible and credible alternative available to power generation is P4 (the generation of power in existing and/or new grid-connected power plants). Because the fossil fuel fired power plants are dominated in North China Power Grid, the same electricity generation with the project can be provided from grid. Therefore the investment barrier, technology barrier and other barriers mentioned above of the project will not be applicable to existing or new coal-fired plants power generation in the Grid.

Alternatives to unused biomass

In the absence of the project activities, the most plausible and credible alternative available to unused biomass is that such biomass would be dumped, left to decay (B1) or burned in an uncontrolled manner without utilizing it for energy purposes (B3). It is common practice in the local area that the biomass residues are dumped or left to decay or burned in an uncontrolled manner without utilizing it for energy purposes. So the biomass usage alternative will not incur any barrier. Therefore the investment barrier, technology barrier and other barriers mentioned above of the project will not be applicable to alternatives of unused biomass.

As analyzed above, the project activity faces barriers that prevent the implementation of this type of project activity and do not prevent the implementation of at least one of the alternatives. Hence, the project activity may be additional.

Step 4 Common practice analysis

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



Till the end of 2006, there are two biomass direct fired power generation project that has been put into operation in Shandong province, they are Shandong Shiliquan Power Plant Coal-fired Boiler Retrofit to Co-fired Boiler Project²⁵ and Shandong Shanxian 25MW Biomass Power Plant²⁶.

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

Shandong Shiliquan Power Plant Coal-fired Boiler Retrofit to Co-fired Boiler Project was put into operation in Dec., 2005. Straw co-fired in the boiler accounts for less than 20%²⁷ of fuel, which is much different from the Project. Moreover, Shandong Shiliquan Power Plant Coal-fired Boiler Retrofit to Co-fired Boiler Project also faces great difficulty such as straw price increasing. The existence of this project will not influence the additionality of the Project.

Shandong Shanxian 25 MW Biomass Power Plant Project was put into operation in November, 2006, which also seeks CDM for overcoming the barriers such as financially unattractive²⁸. This fact provides further evidence of the additionality of the Project.

Therefore, the existence of these projects will not influence the additionality of the Project. Therefore, the project is evident not a common practice.

To summarize, it can be proved that the project activity is additional and not (part of) baseline scenario. Without the CDM revenues, the project activity would not be implemented smoothly. Instead, the equivalent electricity will be provided by the North China Grid. As a result, the reduction of GHG emissions would not be realized. The above additionality analysis provides sufficient evidence that the registration of the CDM revenues can enable the project to improve the barriers it faces.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to the analysis in Section B.4, the baseline scenario applying to the project is shown below:
Table B-8 Combination of the baseline scenario for the project

Scenario	Project Type	Baseline Scenario		
		Power Generation	Use of biomass	Heat Generation
2	Power Greenfield Project	P4	B1 and B3 for cotton stalk B1 for wood residues B1 for wheat bran	No Heat

Based on the description of the methodology, the emission reductions by the project activity during a given year y can be calculated as follows:

²⁵ http://www.1718vip.com/news/scn/news_view.asp?newsid=2818.

²⁶ <http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1394>

²⁷ http://jjdb.dzwww.com/xinwen/200604/t20060428_1452925.htm.

²⁸ <http://cdm.unfccc.int/Project>



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

ER_y : Emissions reductions of the project activity during the year y (tCO₂/yr)

$ER_{electricity,y}$: Emission reductions due to displacement of electricity during the year y (tCO₂/yr)

$ER_{heat,y}$: Emission reductions due to displacement of heat during the year y (tCO₂/yr)

$BE_{biomass,y}$: Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year y (tCO₂e/yr)

PE_y : Project emissions during the year y (tCO₂/yr)

L_y : Leakage emissions during the year y (tCO₂/yr)

The details of the calculation are elaborated shown below:

1. Emission reductions due to displacement of electricity ($ER_{electricity,y}$)

Since the capacity of the project plant (30MW) is more than 15MW, the CO₂ emission factor for the electricity displaced can be calculated as a combined margin following the guidance of ACM0002 and the net quantity of electricity generation in the project plant will be adopted.

According to the ACM0002, it is required to estimate the Operating Margin (OM) and Build Margin (BM) emission factor ex-ante, and through weighted average of OM and BM, the Combined Margin baseline emission factor of the North China Grid can be obtained, and the emission reductions due to displacement of electricity can be estimated. The details are shown below.

STEP 1. Calculate the Operating Margin emission factor(s) ($EF_{OM,y}$) based on one of the four following methods:

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

The method (c) requires the detailed operation and dispatch data of power plants in the grid. But there is no publicly available dispatch data for the North China Grid. Therefore, the method (c) is not applicable.

The method (b), simple adjusted OM, needs the annual load duration curve of the grid. Based on the same reason stated in the above paragraph, the necessary data for the method (b) are difficult to obtain, so the method (b) is not applicable.

The method (d), average OM, is applicable only if low-cost/must run resources²⁹ constitute more than 50% of total amount of power generation in the grid. According to the data from *China Power Yearbook 2005*, the total power generation of the North China Grid in 2004 is 530,804,000 MWh³⁰, in which coal-fired power generation is 526,772,000 MWh, accounting for 99.24%. Therefore, the North China Grid generation system is dominated by coal-fired power, and this fact will not change in a quite long time ahead. So the method (d) is not applicable.

The Simple OM method (a) is applicable if low-cost/must run resources constitute less than 50% of total amount of power generation in the grid in average of the five most recent years. The share of the low-

²⁹ Low operating cost and must run resources typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal-fired power is obviously a must-run, it should also be included in this list, i.e. excluded from the set of plants.

³⁰ *China Electric Power Yearbook 2005*, P474



cost/must run resources in the North China Grid are 4.5% (1999), 5.2% (2000), 4.4% (2001), 4.5% (2002), 3.6% (2003), and 3.2% (2004) respectively. Therefore, it is reasonable to select the method (a) to calculate the OM emission factor.

According to the ACM0002, the Simple OM emission factor ($EF_{OM, simple, y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO₂/MWh) of all generating sources that serve the system, excluding low-operating cost and must-run power plants. The formula of $EF_{OM, simple, y}$ calculation is

$$EF_{OM, simple, y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j,y}}{\sum_j GEN_{j,y}} \quad (2)$$

where:

$F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y , while j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid³¹;

$COEF_{i,j,y}$ is the CO₂ emission coefficient of fuel i (tCO₂ / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y ;

And $GEN_{j,y}$ is the electricity (MWh) delivered to the grid by the source j .

The CO₂ emission coefficient $COEF_{i,j,y}$ is obtained as

$$COEF_{i,j,y} = NCV_i \cdot EF_{CO_2, i} \cdot OXID_i \quad (3)$$

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel i ;

$OXID_i$ is the oxidation factor of the fuel i , (use default values of IPCC);

$EF_{CO_2, i}$ is the CO₂ emission factor per unit of energy of the fuel i .

If available, local values of NCV_i and $EF_{CO_2, i}$ shall be used. If not, country-specific values are preferable to IPCC default values. In this PDD, NCV_i of different fuels are obtained from *China Energy Statistical Yearbook 2004*. With regard to the fuel types where NCV_i fluctuate in a certain range, the floor values of the fluctuation range are used for conservatism. $EF_{CO_2, i}$ of fossil fuel come from IPCC default values.

The Simple OM Emission Factor ($EF_{OM, simple, y}$) of the proposed project is calculated on the basis of the fuel consumption data for electricity generation of the North China Grid, excluding those of low-operating cost and must-run power plants, such as wind power, hydropower and nuclear etc. These data are obtained from the *China Electric Power Yearbook (2003~2005, published annually)* and *China Energy Statistical Yearbook (2000~2005)*. Based on these data, the Simple OM Emission Factor ($EF_{OM, simple, y}$) of the North China Grid is calculated as 1.069 tCO₂e/MWh (see Annex 3 for details).

For the project, the renewable crediting period, i.e. 7*3 years, is adopted as same as the registered PDD.

³¹ As described above, imports from a connected electricity system should be considered as one power source j .

STEP 2. Calculate the Build Margin emission factor ($EF_{BM,y}$):

According to ACM0002, $EF_{BM,y}$ is determined by the formula as follow:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m,y}}{\sum_m GEN_{m,y}} \quad (4)$$

where $F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{m,y}$ are analogous to the variables described for the simple OM method in step 1 for plants m.

ACM0002 provides two options for sample group m:

- (1) The five power plants that have been built most recently, or
- (2) The power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

The one with larger annual generation should be used.

In the North China Grid, the information on the five power plants built most recently is not available. According to the EB's guidance on DNV deviation request, the EB accepted the following deviation³²:

- Use of capacity additions during last 1 - 3 years for estimating the build margin emission factor for grid electricity;
- Use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin (BM).

Therefore, this proposed project uses the alternative method to calculate $EF_{BM,y}$, and the formula is

$$EF_{BM,y} = \left[EF_{BTCA_fire,y} \times CAP_{fire,y-n,y} \right] / \left[\sum_j CAP_{j,y-n,y} \right] \quad (5)$$

Where $CAP_{fire,y-n,y}$ is the incremental installed capacity of fuel-fired power (MW) in y year compared to that of y-n year;

$\sum_j CAP_{j,y-n,y}$ is the total incremental installed capacity of various power sources in the grid during the years from y to y-n year;

$\left[CAP_{fire,y-n,y} \right] / \left[\sum_j CAP_{j,y-n,y} \right]$ represents the share of incremental installed capacity of fuel-fired power in the whole incremental installed capacity.

where, n is fixed by:

³² <http://cdm.unfccc.int/Projects/Deviations>



Starting from y year, the differences of installed capacity between y year and $y-1$ year, y year and $y-2$ year, ... y year and $y-n$ year, y year and $y-n-1$ year, ... are calculated respectively, and then divided by the installed capacity of y year. The year that can make the left-hand side of the following formula greater than 20% will be regarded as n . The formula is as follows:

$$\frac{\sum_j CAP_{j,y-n}}{\sum_j CAP_{j,y}} \geq 20\% \quad (6)$$

$EF_{BTCA_fire,y}$ is the emission factor of fuel-fired power with best technology commercially available (BTCA). It represents the trend of decreased coal consumption in the fuel-fired power generation brought by technology advancement in the coming years. Compared with the method for $EF_{BM,y}$ provided by ACM002 Methodology, the value of $EF_{BTCA_fire,y}$ is lower than that of other types of fuel-fired power plants to be built in the grid, because the emission factor of the alternative method reflects the fuel efficiency of the fuel-fired power plants which use the best technology commercially available. Therefore, the building margin factor through this method is conservative.

The following section describes the process of calculating $EF_{BTCA_fire,y}$ for the North China Grid. According to the data from *China Power Yearbook 1999-2005*, and with the year 2004 regarded as the most recent year of y , the incremental installed capacity between year 2001 and year 2004 are used for $EF_{BM,y}$ calculation.

The calculation for value of $EF_{BTCA_fire,y}$ is based on the 320g/kWh of standard coal consumption for fuel-fired power generation. According to statistic information in China, the standard coal consumption for fuel-fired power generation in 2000 is 350g/kWh. And if various measures aimed at improving energy efficiency can be carried out, the value of 350g/kWh is expected to reduce to 320g/kWh by 2010. As the gas/oil consumption in the North China Grid is very small and negligible, emission factor of the best technology (320g/kWh) is treated as $EF_{BTCA_fire,y}$.

By multiplying the value of $[CAP_{fire,y-n,y}] / [\sum_j CAP_{j,y-n,y}]$ with the value 0.886 of $EF_{BTCA_fire,y}$, the value of $EF_{BM,y}$ is 0.880. (See Annex 3 for details)

Step3. Calculate the baseline emission factor EF_y

Based on ACM002, the baseline emission factor EF_y should be calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$), where the weights w_{OM} is 0.5 and w_{BM} is 0.5 by default, and ($EF_{OM,y}$) and ($EF_{BM,y}$) are calculated as described in Step 1 and 2.

$$EF_y = 1.069 * 0.5 + 0.880 * 0.5 = 0.975 \text{ (tCO}_2\text{e/MWh)} \quad (7)$$

Step4. Calculate the Emission reductions ($ER_{electricity,y}$)

Therefore, baseline emissions can be calculated as below:

$$ER_{electricity,y} = EG_y * EF_{electricity,y} \quad (8)$$



According to the actual operation data in 2008/2009 and plans in following years, EG_y is expected to be 187,626 MWh and was discounted 0.5% for conservation because the accuracy 0.5 of main-meter is lower than 0.2S in the registered PDD.

2. Emission reductions due to displacement of heat ($ER_{heat,y}$)

Emission reductions due to displacement of heat ($ER_{heat,y}$) is not considered for the project.

3. Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues ($BE_{biomass,y}$)

According to ACM0006, for the scenario 2, Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues ($BE_{biomass,y}$) should be determined consistent with the most plausible baseline scenario for the use of the biomass. In details the $BE_{biomass,y}$ is determined in two steps:

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

Since the baseline scenario has been identified as scenario 2, the total quantity of biomass residues used in the project plant is attributable to project activity and hence $BF_{PJ,k,y} = BF_{k,y} = 67,833/96,795/12,498$ tons of dry cotton stalk, wood residues and wheat bran (the annual 90,215\140,630\16,661³³ tons of cotton stalk, wood residues and wheat bran are consumed with the moisture content of 24.81 %, 31.17 %, 24.99 % respectively).

Step 2 Estimation of methane emissions, consistent with the baseline scenario for the use of biomass residues.

As the baseline scenario for biomass residue use has been identified as B1 and B3, then the methane emissions can be calculated by multiplying the quantity of biomass that would not be use in the absence of the project activity with the net calorific value and an appropriate emission factor:

$$BE_{biomass,y} = GWP_{CH4} * \sum_k BF_{PJ,k,y} * NCV_k * EF_{burning,CH4,k,y} \quad (9)$$

Where:

GWP_{CH4} : the Global Warming Potential for methane valid for the relevant commitment period which is equal to 21 in this PDD.

$BF_{PJ,k,y}$: the incremental quantity of biomass residue type k used as fuel in the project plant during the year y in tons. Based on the actual operation data in 2008/2009, the annual used biomass residues will be 67,833\ 96,795\12,498 tons of dry cotton stalk, wood residues and wheat bran respectively.

NCV_k : the net calorific value of the biomass residues type k in GJ per tons of dry matters, for the project, the value of 13.71\ 14.66\11.87 GJ/t on dry base is applied for cotton stalk, wood residues and wheat bran respectively which were monitored by chemical laboratory onsite..

$EF_{burning,CH4,k,y}$: the CH_4 emission factor for uncontrolled burning of the biomass residues type k in tCH_4/TJ . As there is no accurate information about the CH_4 emission factor, the default value of 0.0027 $tCH_4/tons$ is adopted in the PDD according to ACM0006. Considering the uncertainty is greater than

³³ Data source: Calculated according to actual operation data in 2008/2009.



100%, therefore a conservativeness factor of 0.73 is used in this PDD, thus the CH₄ emission factor of 0.001971 tCH₄/ tons biomass residues should be used.

4. PE_y : Project emissions during the year y (tCO₂/yr)

As described in ACM0006, the project emissions include CO₂ emissions from transportation of biomass residues to the project site ($PE_{T,y}$), CO₂ emissions from on-site consumption of fossil fuels due to the project activity ($PE_{FF,y}$), CO₂ emissions from consumption of electricity ($PE_{EC,y}$) and CH₄ emission from the controlled combustion of biomass residues ($PE_{biomass,CH_4,y}$).

Then the project emission can be calculated as:

$$PE_y = PET_y + PEFF_y + PE_{EC,y} + GWP_{CH_4} * PE_{biomass,CH_4,y} \quad (10)$$

Step1 Methane emissions from combustion of biomass residues ($PE_{biomass,CH_4,y}$)

Methane emissions from combustion of biomass residues can be calculated as follows:

$$PE_{biomass,CH_4,y} = EF_{CH_4,BF} * \sum_k BF_{k,y} * NCV_k \quad (11)$$

where:

$BF_{k,y}$: the quantity of biomass residues used as fuel in the project plant during the year y in tons,. Based on the actual operation data in 2008/2009, the annual used biomass residues will be 67,833\96,795\12,498 tons of dry cotton stalk, wood residues and wheat bran respectively.

NCV_k : the net calorific value of the biomass residues type k in GJ per tons. Based on the inspection report in chemical laboratory of the power plant, it is taken as 13.71\14.66\11.87 GJ/t on dry base for cotton stalk, wood residues and wheat bran respectively which were monitored by chemical laboratory onsite.

$EF_{CH_4,BF}$: the CH₄ emission factor for controlled burning of the biomass residues in tCH₄/TJ. According to the IPCC default value provided in table 3 of ACM0006, the CH₄ emission factor of combustion of biomass in agriculture is 0.03 tCH₄/TJ. Considering a conservativeness factor of 1.37, the CH₄ emission factor in this PDD is taken as 0.0000411 tCH₄/GJ.

Step 2 Carbon dioxide emissions from combustion of fossil fuels for transportation of biomass residues ($PE_{T,y}$)

Transporting biomass from the suppliers to the project site is normally done by trucks, which results in direct GHG emissions. The emissions related to biomass transportation to the plant in year y can be calculated as follows:

$$PET_y = N_y \times AVD_y \times EF_{km,CO_2,y} \quad (12)$$

where:

$PE_{T,y}$: CO₂ emissions during the year y due to transport of the biomass residues to the project plant (tCO₂/yr)

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). All the biomass residues supply sites are within 50 kilometres away around the site of the project, therefore the conservative value of 100 is chosen to calculate.



$EF_{km,CO_2,y}$: Average CO₂ emission factor for the trucks measured during the year y (tCO₂/km). Since the truck applied in the project has the truck load of 5 tons, the IPCC default of 0.001011 for the Heavy Duty Diesel Vehicle is applied.

N_y : Number of truck trips during the year y

The baseline methodology ACM006 Version 04 stated that project participants may choose between two different formulas to determine emissions, but project owner found that N_y is accurate and easy to be monitored, so formula (12) was selected. Please see monitoring plan below for details.

Step 3 Carbon dioxide emissions from on-site consumption of fossil fuels ($PEFF_y$)

The boiler does not need fossil fuel for start-ups, but some machines, which are for the preparation and on-site transportation, could consume some diesel, which is estimated to be 100 tons/y. The diesel consumed will be consist with the types of the machines applied and the operational situations, and it will be monitored ex-post during the operational period as described in B.7. The GHG emissions from on-site consumption of fossil fuels will be calculated as follows:

$$PEFF_y = \sum_i (FF_{project.plant,i,y} + FF_{project.site,i,y}) * NCV_i * COEF_i \quad (13)$$

where:

$FF_{project.plant,i,y}$: Quantity of fossil fuel type i combusted in the project plant during the year y (ton/year), which is 0.

$FF_{project.site,i,y}$: Quantity of fossil fuel type i combusted at the project plant during the year y (ton/year), which is considered 100 tons.

NCV_i : Net calorific value of diesel (GJ/ton), which is 42.652 GJ/ton

$COEF_i$: CO₂ emission factor for the diesel (tCO₂/ GJ), which is 0.0741 t CO₂/ GJ

Step 4 Carbon dioxide emissions from electricity consumption ($PE_{EC,y}$)

All the on-site electricity consumption is provided by the project itself, therefore, the Carbon dioxide emissions from electricity consumption on-site is not considered, since $EC_{PJ,y}$ used in the calculation above is the net power delivered to the grid.

The electricity consumption at the 8 biomass residue storage sites is assumed 10 KWh/ton biomass residues. Therefore this value is considered to be 2,475 MWh/year (10 KWh/ton biomass residues multiply 247,506 tons wet biomass residues) for calculation in this PDD. The power meters have been installed to measure the actual power purchased from the grid.

Therefore, $PE_{EC,y} = EC_{PJ,y} * EF_{grid,y}$

$EF_{grid,y} = 0.975$ tCO₂e/MWh, as calculated above.

5. L_y : Leakage emissions during the year y (tCO₂/yr)

In the registered PDD there is only source of cotton stalk was investigated, but there are three types of biomass residues combusted in the power plant, so the notification PDD added information on the investigation of possible leakage for all the three kinds of biomass residues fired (and/or to be fired) in the power plant.



Table of Biomass resource statistical reports is below:

	cotton stalk (t)	wood residues (t)	wheat bran (t)
Available Biomass in the region	966,614	1,226,463	90,450
Biomass utilised out of the project	204,070	316,150	13,300
Biomass utilised by the project	90,215	140,630	16,661
Total biomass utilised, including the project	294,285	456,780	29,961
Available Biomass/Total biomass utilised	328%	268%	302%
Available Biomass/Total biomass utilised - 100%	228%	168%	202%
Abundant surplus? (More than 25%)	Yes	Yes	Yes

According to the project actual situation, the PP select approach L2 to demonstrate that the biomass residues used in the plant did not increase fossil fuel consumption.

As the “Biomass resource statistical reports” stated, the available cotton stalk, wood residues, wheat bran in local region around the project site is 228%, 168%, 202% more than the total biomass utilised separately. This stated that the supplies of cotton stalk, wood residues, wheat bran are far more than the demand by the project for each of the three biomass residues types.

Furthermore, as mentioned before, as for the wood residues, according to the statements from Gaotang County plate plant, Gaotang County Qingyuan Biomass Fuel Co.Ltd., 63 retail suppliers, Shandong Quanlin Paper factory mentioned above, the wood residues and wheat bran supplied do not result in any increase of the processing capacity of raw input or in other substantial changes in this process.

The conclusion is that each of the biomass supply to the project is sufficient and will not lead to the displacement of the current use of each biomass type as a fuel.

Therefore, the situation complies with the approach L₂, and the leakage for the project activity is considered zero:

$$L_y = 0 \quad (14)$$

Thus PPs confirmed that there is no need to identify equation(s) to calculate the Leakage for the three biomass residues for the project activity.

The supply / demand status within the proposed project influence area will be periodically monitored as indicated in the chosen baseline and monitoring methodologies applied to this project activity.

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

Data / Parameter:	GWP_{CH_4}
Data unit:	tCO ₂ e/tCH ₄
Description:	Global Warming Potential for CH ₄
Source of data used:	IPCC default value
Value applied:	21 for the first commitment period.



Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	Shall be updated according to any future COP/MOP decisions.

Data / Parameter:	$EF_{km,CO_2,y}$
Data unit:	tCO ₂ /km
Description:	Average CO ₂ emission factor for transportation of biomass with trucks
Source of data used:	IPCC 2006 default value from the Moderate Control index for the US heavy Duty Diesel Vehicle
Value applied:	0.001011
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	IPCC value from the latest version published will be utilized

Data / Parameter:	Net Calorific Value (NCV) of the diesel
Data unit:	GJ/tonne
Description:	Net Calorific Value (NCV) of diesel combusted in the proposed project
Source of data used:	China Energy Statistical Yearbook 2005
Value applied:	42.652
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	$COEF_i$
Data unit:	tCO ₂ / GJ
Description:	CO ₂ emission factor for the diesel (t CO ₂ / GJ)
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	0.0741
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	



Data / Parameter:	$COEF_i$
Data unit:	tCO ₂ / GJ
Description:	CO ₂ emission factor for the coal (t CO ₂ / GJ)
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	0.0946
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	$F_{i,j,y}$
Data unit:	Mtons, Mm ³
Description:	the amount of fuel <i>i</i> (in a mass or volume unit) consumed by relevant power sources <i>j</i> in year(s) <i>y</i>
Source of data used:	China Energy Statistical Yearbook (2000~2005)
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	

Data / Parameter:	NCV_i
Data unit:	TJ/ mass or volume unit of a fuel
Description:	the net calorific value (energy content) per mass or volume unit of a fuel <i>i</i>
Source of data used:	China Energy Statistical Yearbook (2005)
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Local values
Any comment:	

Data / Parameter:	$EF_{CO_2,i}$
Data unit:	KgCO ₂ /TJ
Description:	the Effective CO ₂ emission factor
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	See Annex 3 for details
Justification of the choice of data or	IPCC default value



description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	<i>BTCA</i>
Data unit:	<i>g/kWh</i>
Description:	fuel consumption for best technology commercially available
Source of data used:	<i>Fuel-fired Power Generation.</i> http://www.ccchina.gov.cn/source/fa/fa2002082803.htm
Value applied:	320g/kWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to China's statistical data, the standard coal consumption for fuel-fired power generation in 2000 is 350g/kWh. And if various measures aimed at improving energy efficiency could be carried out, the value of 350g/kWh is expected to reduce to 320g/kWh by 2010 ³⁴ . Therefore, the value of $EF_{BTCA_fire,y}$ is conservative.
Any comment:	

Data / Parameter:	CAP_{fire-y}
Data unit:	MW
Description:	installed capacity of fuel-fired power in year y within the north china grid
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	

Data / Parameter:	CAP_y
Data unit:	MW
Description:	Total installed capacity of various power in year y within the north china grid
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	

³⁴ Fuel-fired Power Generation. <http://www.ccchina.gov.cn/source/fa/fa2002082803.htm>

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

The emission reductions by the project are calculated as follows:

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

Emission reductions due to displacement of electricity ($ER_{electricity,y}$)

As described above, EG_y is 187,626 MWh and $EF_{electricity,y}$ is estimated to be 0.975 tCO₂e/MWh, therefore $ER_{electricity,y} = EG_y * EF_{electricity,y} = 182,935$ tCO₂/y³⁵.

Emission reductions due to displacement of heat ($ER_{heat,y}$)

Emission reductions due to displacement of heat ($ER_{heat,y}$) is not considered for the project. Therefore, $ER_{heat,y} = 0$ tCO₂/y

Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues ($BE_{biomass,y}$)

$$BE_{biomass,y} = GWP_{CH4} * BF_{PJ,k,y} * NCV_k * EF_{burning,CH4,k,y}$$

As described above, where:

$$GWP_{CH4} = 21$$

$BF_{PJ,k,y} = 67,833/96,795/12,498$ tons of dry cotton straw, wood residues and wheat bran separately.

$$NCV_k * EF_{burning,CH4,k,y} = 0.001971$$
 tCH₄/ton

Therefore, $BE_{biomass,y}$ is calculated to be 7,331 tCO₂/y

PE_y : Project emissions during the year y (tCO₂/yr)

The project emission can be calculated as:

$$PE_y = PET_y + PEFF_y + PE_{EC,y} + GWP_{CH4} * PE_{biomass,CH4,y}$$

1. Equivalent carbon dioxide emissions from Methane emissions due to combustion of biomass residues ($GWP_{CH4} * PE_{biomass,CH4,y}$)

Methane emissions from combustion of biomass residues can be calculated as follows:

$$PE_{biomass,CH4,y} = EF_{CH4,BF} * BF_{k,y} * NCV_k$$

As described above where:

$BF_{k,y} = 67,833/96,795/12,498$ tons of dry cotton straw, wood residues and wheat bran separately.

$NCV_k = 13.71/14.66/11.87$ GJ/t on dry base for cotton stalk, wood residues and wheat bran respectively.

$$EF_{CH4,BF} = 0.0000411$$
 tCH₄/GJ.

Since $GWP_{CH4} = 21$, $GWP_{CH4} * PE_{biomass,CH4,y}$ will be calculated to be 2,157 tCO₂/y

³⁵ Note: Because the accuracy 0.5 of main-meter is lower than 0.2S in the registered PDD, so EGproject planty was discounted 0.5% for conservation. The final value of ERelectricity,y is 182,935 * (1-0.5%) = 182,020 tCO₂/y



2. Carbon dioxide emissions from combustion of fossil fuels for transportation of biomass residues (PET_y)

$$PET_y = N_y \times AVD_y \times EF_{km,CO_2,y}$$

As described above, where:

$$AVD_y = 100 \text{ Km}$$

$$EF_{km,CO_2,y} = 0.001011 \text{ tCO}_2/\text{Km}$$

$$N_y = 35,426$$

Therefore, PET_y is calculated to be 3,582 tCO₂/y

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

$$PEFF_y = \sum_i (FF_{project.plant,i,y} + FF_{project.site.i,y}) * NCV_i * COEF_i \quad (13)$$

where:

$$FF_{project.plant,i,y} = 0 \text{ t}$$

$$FF_{project.plant,i,y} = 100 \text{ t}$$

$$NCV_i = 42.652 \text{ GJ/t}$$

$$COEF_i = 0.0741 \text{ tCO}_2/\text{GJ}$$

Therefore, $PEFF_y$ is calculated to be 317 tCO₂/y

4. Carbon dioxide emissions from electricity consumption ($PE_{EC,y}$)

$$PE_{EC,y} = EC_{PJ,y} * EF_{grid,y}$$

$$EC_{PJ,y} = 2,475 \text{ MWh,}$$

$$EF_{grid,y} = 0.975 \text{ tCO}_2\text{e/MWh,}$$

Therefore, $PE_{EC,y}$ is calculated to be 2,414 tCO₂/y

L_y : Leakage emissions during the year y (tCO₂/yr)

Since the situation for the project complies with the approach 2 L₂, the leakage for the proposed project activity is considered 0 (leakage_y = 0).

To conclude,

$$ER_y = 180,881 \text{ t CO}_2/\text{y}$$

B.6.4 Summary of the ex-ante estimation of emission reductions:
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Year	Estimation of project activity emissions (tons of CO ₂)	Estimation of baseline emissions (tons of CO ₂)	Estimation of leakage (tons of CO ₂)	Estimation of emission reductions (tons of CO ₂)
20/03/2008-19/03/2009	8,470	189,351	0	180,881
20/03/2009-19/03/2010	8,470	189,351	0	180,881
20/03/2010-19/03/2011	8,470	189,351	0	180,881
20/03/2011-19/03/2012	8,470	189,351	0	180,881
20/03/2012-19/03/2013	8,470	189,351	0	180,881
20/03/2013-19/03/2014	8,470	189,351	0	180,881
20/03/2014-19/03/2015	8,470	189,351	0	180,881
Total (tons of CO ₂)	59,290	1,325,457	0	1,266,167

B.7 Application of the monitoring methodology and description of the monitoring plan:
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B.7.1 Data and parameters monitored:

Data / Parameter:	EG _v
Data unit:	MWh
Description:	Net quantity of electricity delivered to grid in year y
Source of data to be used:	Measured by meters with the accuracy of not less than 0.5
Value of data applied for the purpose of calculating expected emission reductions in section B.5	187,626
Description of measurement methods and procedures to be applied:	Continuous on-site measurements and monthly recording by the power distribution company.
QA/QC procedures to be applied:	The electricity meter will be operated by the power distribution company and calibrated periodically according to relevant national standards (for example: JJG596-1999).Data measured by meters will be cross checked by the electricity sales receipts.
Any comment:	The meters accuracy level is 0.2s in the registered PDD. In the project actual implementation stage, the monitoring equipment accuracy level is 0.5.



	<p>The accuracy level 0.5 in this project is in line with national standard “Technical Administrative Code of Electric Energy Metering”(DL/T448-2000) : it is required that power plants with installed capacity under 100MW must use electricity meters with accuracy level not inferior than 1.0 in paragraphs 5.1.3 and 5.3 of DL/T448-2000. So the accuracy 0.5 of the main meter in this project is in line with national standard (DL/T448-2000) .</p> <p>According to the PPA signed between the project owner and the North-China Power Grid (Liaocheng Power Supply Bureau) , the North-China Power Grid has the right to possess, operate and maintain the Main Meter. Which means that the project owner has no right to settle or change the accuracy of the main meter, Liaocheng Power Supply Bureau set the accuracy of the main meter to be 0.5 which is just common practice in Shandong Provincial Power Grid.</p> <p>Furthermore, PPs decided to discount 0.5% of EG_y monitored by electricity meter with accuracy 0.5 for conservation.</p>
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Data / Parameter:	$BF_{k,y}$
Data unit:	tons
Description:	Quantity of biomass residue type k combusted in the project plant during the year y
Source of data to be used:	Project Records from Project Procurement department of plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	247,506
Description of measurement methods and procedures to be applied:	<p>On site measured by weight meters and adjust for the moisture content in order to determine the quantity of dry biomass..</p> <p>Meters at the weighing station will undergo maintenance subject to national standards (for example: JJG907-2003). Any direct measurement with mass or volume meters at the plant site will be cross checked with the quantity of electricity generated and biomass fuel purchase receipts (if available), and prepare annually an energy balance sheet.</p>
QA/QC procedures to be applied:	Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes.
Any comment:	

Data / Parameter:	Moisture content of the biomass residues
Data unit:	% water content
Description:	Moisture content of each biomass residue type k
Source of data to be used:	On-site measurements by moisture analyzer
Value of data applied for the purpose of	24.81 %, 31.17 %, 24.99 % of cotton stalk, wood residues and wheat bran



calculating expected emission reductions in section B.5	respectively.
Description of measurement methods and procedures to be applied:	Continuously monitored by moisture analyzer. Moisture content of the biomass residues will be both measured in the power plant and calculated the mean values at least annually.
QA/QC procedures to be applied:	
Any comment:	In case of dry biomass, monitoring of this parameter is not necessary

Data / Parameter:	NCV_k
Data unit:	TJ / tonne
Description:	Net calorific value of biomass residue type k consumed by the project
Source of data to be used:	Measured in project plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.01371 TJ/tonne, 0.01466 TJ/tonne and 0.01187 TJ/tonne on dry base for cotton stalk, wood residues and wheat bran respectively.
Description of measurement methods and procedures to be applied:	The net calorific value of biomass residues should be measured and reported in the chemical laboratory at least per six months. For each test, at least three samples should be measured for each batch of biomass type.
QA/QC procedures to be applied:	Check consistency of data from the different resources. If the values differ significantly, the most conservative will be used.
Any comment:	Three samples (dry matter) should be analyzed at the same time by the test institution and reported, and the average of NCV of these samples should be used in the emission reduction calculation. The analysis will be made at least every six months. And, NCV of all types of biomass fuels should be tested separately.

Data / Parameter:	AVD_v
Data unit:	km
Description:	Average return trip distance (from and to) between biomass fuel supply sites and the project site
Source of data to be used:	Records by project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100
Description of measurement methods and procedures to be applied:	Distance travelled by trucks will be continuously monitored and recorded. Data will be archived 2 years following the end of the crediting period.
QA/QC procedures to	Check consistency of distance records provided by the truckers by comparing



be applied:	recorded distances with information from other sources (e.g. maps).
Any comment:	If biomass is supplied from different sites, this parameter should correspond to the mean value of km travelled by trucks that supply the biomass plant

Data / Parameter:	N_y
Data unit:	
Description:	Number of truck trips for the transportation of biomass.
Source of data to be used:	On-site measurement
Value of data applied for the purpose of calculating expected emission reductions in section B.5	35,426
Description of measurement methods and procedures to be applied:	Whenever the truck arrives in the power plant, the statistician puts down the number in the data collection system for calculating project emissions.
QA/QC procedures to be applied:	Check consistency of the number of truck trips with the quantity of biomass combusted, e.g. by the relation with previous years.
Any comment:	

Data / Parameter:	$EF_{km,CO_2,y}$
Data unit:	tCO ₂ /km
Description:	Average CO ₂ Emission Factor for transportation of biomass with trucks
Source of data to be used:	It is impossible to conduct sample measurements of the fuel type fuel consumption and distance traveled for all truck types, and reliable national default values is not available, so PP selected to use IPCC 2006 default value from the Moderate Control index for the US heavy Duty Diesel Vehicle
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.001011
Description of measurement methods and procedures to be applied:	Will be updated according to IPCC latest version. Minimal of two years after last issuance of CERs
QA/QC procedures to be applied:	Cross-check IPCC default value with other available literatures.
Any comment:	

Data / Parameter:	$FF_{project\ plant,i,y}$
Data unit:	tons
Description:	Quantity of diesel combusted in the biomass residue fired power plant during the year y
Source of data to be	Project Records from Project Procurement department of plant



used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	According to the actual design, the boiler does not need any diesel for start-ups, so no monitoring equipment has been settled to monitor $FF_{\text{project plant},i,y}$. $FF_{\text{project plant},i,y}$ is 0 and fixed during the whole project operation stage.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$FF_{\text{project site},i,y}$
Data unit:	tons
Description:	Quantity of diesel combusted at the project site for other purposes that are attributable to the project activity during the year y.
Source of data to be used:	Direct measurement and calculation in the procurement department of plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100
Description of measurement methods and procedures to be applied:	This parameter is used to measure the volume quantity of diesel consumed by on site-vehicle which used for preparation of the biomass residues. The parameter will be measured by flow meter(s) which operated and controlled by the diesel supplier, and the monitoring equipments will be calibrated by authorised third party periodically. The volume quantity of diesel will be multiplied by density of diesel ρ_{diesel} to get the mass quantity of diesel. The data will be crosschecked by purchase receipts. Data will be archived 2 years following the end of the crediting period.
QA/QC procedures to be applied:	The consistency of metered diesel consumption should be crosschecked with purchase receipts.
Any comment:	

Data / Parameter:	ρ_{diesel}
Data unit:	kg/liter
Description:	Density of diesel
Source of data to be used:	Use accurate and reliable national data in the national standard “automobile diesel fuel GB/T19147-2003”.
Value of data applied for the purpose of calculating expected emission reductions in	0.86 kg/liter



section B.5	
Description of measurement methods and procedures to be applied:	For this project, the relevant data source for diesel density is unavailable from diesel supplier side. The project owner selected the most conservative value from the national standard: 0.86 kg/liter for $FF_{project,site>i.,y}$ calculation(GB/T19147-2003 adopts 0.82-0.86 kg/liter for the density of diesel.), and this is conservative.
QA/QC procedures to be applied:	The available default value from GB/T19147-2003 is used, but will be reviewed for the appropriateness of the GB/T19147 annually.
Any comment:	

Data / Parameter:	$EF_{CO_2,FF,i}$
Data unit:	tCO ₂ /GJ
Description:	CO ₂ Emission Factor for fossil fuel type <i>i</i>
Source of data to be used:	IPCC default value(table 1.4, chapter 1, volume 2: energy)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.0741
Description of measurement methods and procedures to be applied:	The available default values will be applied for this project.
QA/QC procedures to be applied:	The available default values are used, but will be reviewed for the appropriateness of the data annually with latest version of IPCC.
Any comment:	

Data / Parameter:	NCV_i
Data unit:	GJ / ton fossil fuel
Description:	Net Calorific Value of fossil fuels combusted at the project site for other purposes that are attributable to the project activity during the year <i>y</i>
Source of data to be used:	China Energy Statistical Yearbook
Value of data applied for the purpose of calculating expected emission reductions in section B.5	42.652 GJ/ton
Description of measurement methods and procedures to be applied:	The Values for the fossil fuels are utilized from the China Energy Statistical Yearbook, which Shall be updated according to China Energy Statistical Yearbook new version annually.
QA/QC procedures to be applied:	Check data from China Energy Statistical Yearbook with default values by the IPCC. If the values differ significantly from IPCC default values, possibly collect additional information or conduct measurements.
Any comment:	

Data / Parameter:	$NCV_k * EF_{burning,CH_4,k,y}$
--------------------------	---------------------------------



Data unit:	tCH ₄ / ton biomass residue
Description:	CH ₄ emission factor for uncontrolled burning of the biomass residue type k during the year y
Source of data to be used:	In the baseline methodology
Value of data applied for the purpose of calculating expected emission reductions in section B.5	In the baseline methodology, $NCV_k * EF_{burning,CH_4,k,y} = 0.001971$ tCH ₄ /ton is applied.
Description of measurement methods and procedures to be applied:	The conservative factor (0.73) is applied, as specified in the baseline methodology
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	EF _{CH₄,BF}
Data unit:	tCH ₄ /GJ
Description:	CH ₄ emission factor for the combustion of biomass residues in the project plant
Source of data to be used:	Default values, as provided in Table 3 of ACM0006 (Version 4) which sources from 2006 IPCC Guideline, Volume 2, Chapter 2, Tables 2.2 to 2.6.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	According to the IPCC default value provided in table 3 of ACM0006, the CH ₄ emission factor of combustion of biomass in agriculture is 0.03 tCH ₄ /TJ. Considering a conservativeness factor of 1.37, the CH ₄ emission factor in this PDD is taken as 0.0000411 tCH ₄ /GJ.
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	Check this parameter using the latest version of IPCC value.
Any comment:	

Data / Parameter:	EC _{PL,y}
Data unit:	MWh
Description:	On-site electricity consumption attributable to the project activity during the year y (including the electricity consumed for the preparation of the biomass residue in all collection stations)
Source of data to be used:	The electricity consumed by the project plant is measured by the main meter installed at the power distribution company with accuracy of 0.5. The electricity consumed for the preparation of the biomass residue in all collection stations is measured by meters installed at the collection stations with accuracy of 2.0 separately.
Value of data applied for the purpose of calculating expected emission reductions in	2,475



section B.5	
Description of measurement methods and procedures to be applied:	<p>The electricity consumed by the project plant is continuously on-site measured and monthly recording by the power distribution company.</p> <p>The electricity consumed for the preparation of the biomass residue in all collection stations is continuously measured on-site by meters installed at the collection stations.</p>
QA/QC procedures to be applied:	<p>The electricity main meter will be operated by the power distribution company and calibrated periodically according to relevant national standards (for example: JJG596-1999).</p> <p>The electricity meters installed at the collection stations will be calibrated periodically according to relevant national standards (for example: JJG307-1988 or JJG307-2006).</p> <p>Data measured by meters will be cross checked by the electricity sales receipts..</p>
Any comment:	

Data / Parameter:	
Data unit:	Tons
Description:	Quantity of available biomass residues of type <i>k</i> in the region
Source of data to be used:	Surveys or statistics from local agricultural bureau if national statistics is not available
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Annually
QA/QC procedures to be applied:	
Any comment:	This parameter is applicable since approach L 2 is utilized to rule out leakage.

Data / Parameter:	
Data unit:	Tons
Description:	Quantity of biomass residues of type <i>k</i> that are utilized (e.g. for energy generation or as feedstock) in the defined geographical region
Source of data to be used:	Surveys or statistics from local agricultural bureau if national statistics is not available
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods	Annually



and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	This parameter is applicable since approach L 2 is utilized to rule out leakage.

B.7.2 Description of the monitoring plan:

According to the approved consolidated monitoring methodology ACM0006: “Consolidated monitoring methodology for grid-connected electricity generation from biomass residues” and relevant regulations, a monitoring plan will be made to ensure the application of monitoring.

The application of monitoring mainly includes two parts, data management system and CDM working group. The training about operating information was carried out on 26th, Sep. 2006 for relevant staffs, and the CDM information and monitoring regulations were introduced to the relevant staffs on 19th, Oct. 2006. The main framework is shown in Figure B-2 and details are shown below:

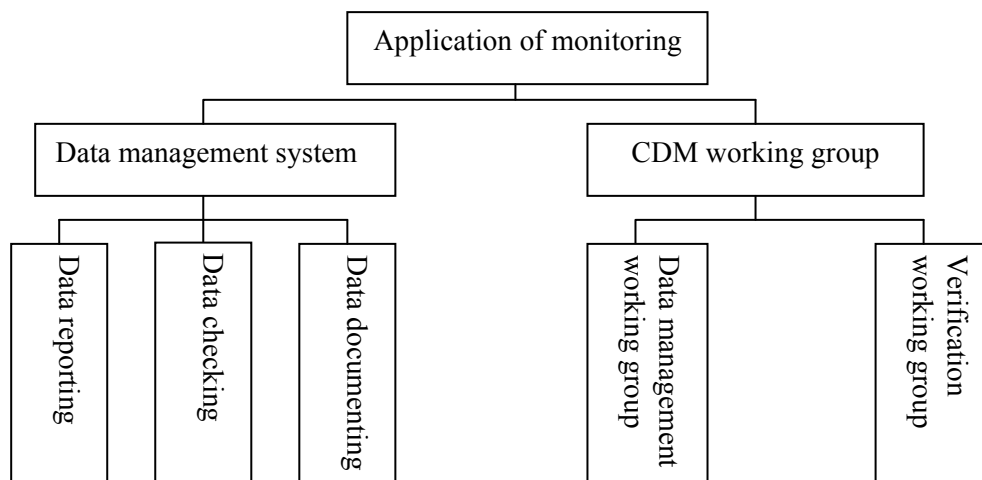


Figure B-2 the main framework for application of monitoring

1. Responsibility

Overall responsibility for daily monitoring and reporting lies with the project company. A CDM group will be established within the project company to carry out the monitoring work. Its staffs will include all relevant people relevant to the data management system and be trained by the experts of the project consultancy.

2. Key definitions

The monitoring plan will use the following definitions of monitoring and verification.

Monitoring: the systematic surveillance of the project's performance by measuring and recording performance-related indicators relevant in the context of GHG emission reductions.

Verification: the periodic ex-post auditing of monitoring results, the assessment of achieved emission reductions and of the project's continued conformance with all relevant project criteria by a selected Designated Operational Entity (DOE).

3. Calibration of Meters & Metering

All meters and instruments will be maintained and calibrated regularly as per industry practices. Maintenance and calibration of meters will be implemented according to national standards and rules. And all the records will be documented and maintained by the project owner.

4. Monitoring

All relevant parameters listed in Section B 7.1 will be monitored according to the methodology requirements and description of measurement methods and procedures to be applied. The results and data will be recorded and well documented. The data and meter reading will be readily accessible for DOE. Calibration tests records will be maintained for verification.

5. Quality Assurance and Quality Control

The quality assurance and quality control procedures for recording, maintaining and archiving data shall be improved as part of this CDM project activity. This is an on-going process that will be ensured through the CDM in terms of the need for verification of the emissions on an annual basis according to this PDD and the CDM manual.



6. Disposal of urgency

Disposal of urgency will be implemented according to the stipulations in the Power Purchase Agreement, Parallel Operation Agreement, Heat Supply Agreement, Fuel Purchase Agreement, and so on. If other fossil fuels are combusted except diesel, the species and amount of the fossil fuel should be recorded in details. The leakage led by this scenario should be calculated precisely and clearly.

7. Data management system

This provides information on record keeping of the data collected during monitoring. Record keeping is the most important exercise in relation to the monitoring process. Without accurate and efficient record keeping, project emission reductions cannot be verified. Below follows an outline of how project related records would be managed.

Overall responsibility for monitoring of GHG emissions reduction will rest with the CDM responsible persons of the working group. The CDM manual sets out the procedures for tracking information from the primary sources to the end-data calculations in paper document format. It is the responsibility of the working group to provide additional necessary data and information for validation and verification requirements of respective DOE. Physical documentation such as paper-based maps, diagrams and environmental assessment will be collated for monitoring, if they are necessary. All paper-based information will be stored by the working group and kept at least one copy.

8. Verification and Monitoring Results

The verification of the monitoring results of the project is a mandatory process required for all CDM projects. The main objective of the verification is to independently verify that the project has achieved the emission reductions as reported and projected in the PDD.

The responsibilities for verification of the project are as follows:

- Sign a verification service agreement with specific DOE and agree to a time framework set by the EB for carrying out verification activities while taking into account the buyer's schedule. The project owner will make the arrangements for the verification and will prepare for the audit and verification process to the best of its abilities.
- The project owner will facilitate the verification through providing the DOE with all required necessary information, before, during and, in the event of queries, after the verification.
- The project owner will fully cooperate with the DOE and instruct its staff and management to be available for interviews and respond honestly to all questions from the DOE.
- DOE must be an Accredited Entity with a proven track record in environmental auditing and verification, experience with CDM projects and work in developing countries. The DOE should be accredited by the CDM Executive Board.
- If the project owner deems that requirements of DOE go beyond the scope of verification, they should contact the CDM consultant to determine whether the requirements of DOE are reasonable. If considered unreasonable, a rejection letter in a written format should be provided to the DOE with justifiable reasons. If the project owner and the DOE cannot reach an agreement, the matter will be submitted to EB or UNFCCC for arbitration.

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

The baseline re-studies and monitoring methodology of the project was completed on 25/01/2011. The persons involved in baseline and monitoring study is Guo zhigang. Email: gzg13066@hotmail.com. The above person is not the project participants listed in Annex 1.

SECTION C. Duration of the project activity / crediting period**C.1 Duration of the project activity:****C.1.1. Starting date of the project activity:**

>>

01/05/2006

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

>>

20 years

C.2 Choice of the crediting period and related information:**C.2.1. Renewable crediting period****C.2.1.1. Starting date of the first crediting period:**

20/03/2008

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:**C.2.2.1. Starting date:**

>>

Not applicable

C.2.2.2. Length:

>>

Not applicable

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

>>

The Environmental Impact Statement Form was completed by the project owner, and approved by the Shandong Environmental Protection Bureau in April, 2006.



According to the Environmental Impact Statement Form of the Project, the environmental impacts arising from the Project are analyzed respectively for the construction phase and the operation phase.

Construction Phase

Noise

Noises generated during the construction period are mainly from construction machines. Since the plant area is 500 m away from the nearest village, noises generated will have little impact on the neighboring residents after relevant measures have been taken. Measures such as making efforts to avoid construction during night, isolating the main working and resting area far from the intensive noise sources, establishing necessary watch room, etc., will be taken, and working staff will be protected and isolated from noises.

Dust

During construction of the Project, foundation excavation, piling up of discarded earth, loading and unloading of raw materials, mixing of concrete and running of vehicles may generate dust at the working site and the surrounding area. Sprinkling water on the surface of discarded earth, timely clearing of the discarded earth, avoiding over loading and spilling in the process of shipping, and the like measures will be taken to reduce the impacts of the dust on the surrounding environment. Dust generated by construction will automatically disappear after completion of the construction.

Waste water

Waste water generated during construction of the Project is mainly residential waste water, which will be discharged after the septic tank treatment. The amount of waste water generated during construction is small, thus having little impact on the environment.

Solid waste

Solid waste generated during construction of the Project is mainly discarded broken bricks and stones, residues from the washing process, various packing stuffs and residential garbage. Discarded broken bricks and stones as well as residues will be used to fill the nearby roadbed. Various packing stuffs will be uniformly recycled or sold to salvage station. Residential garbage will be collected for uniform disposal by the environmental sanitation agencies. The above-mentioned solid waste will not have harmful impacts on the surround environment.

Operation Phase

Waste gas

Air pollutants emitted during construction of the Project are largely flue gas, SO₂ and NO_x. Since sulphur content of the straw is low and cyclone plus bag-type two-step dust extractor as well as low-nitrogen combustion system are employed, waste gas emissions from the Project are far lower than the requirement of *Emission Standard of Air Pollutants for Thermal Power Plants (GB13223-2003)*, details of which can be referred to Table D-1. After being dedusted, flue gas of the Project will be emitted passing a 120 m high chimney with an inner diameter of 3 m, which reduces the impacts of unorganized low-altitude emissions resulting from combusting straw on the environment and contributes to the improvement of regional environmental status.

Table D-1. Emissions of air pollutants by the Project



Item	Phase III standard (mg/m ³) of <i>Emission standard of air pollutants for thermal power plants (GB13223-2003)</i>	Emission concentration of the Project (mg/m ³)
SO ₂	<400	232.9
NO _x	<450	220
Flue gas	<50	13.93

Noise

Measures such as employing low-noise equipment, adopting noise damping, sound isolation and damping measures, establishing noise isolation belt, strengthening worker protection and reinforcing planting work within the plant area and so on will be taken by the Project to reduce the impacts of noises on the working staff and the surrounding environment.

Both the normal operation and air discharge process by the boilers of the Project satisfy the Category 2 standard of Standard of environmental noise of urban area (GB3096-93), which have very little impact on the surrounding sensitive targets. According to the Category II standard of Standard of noise at boundary of industrial enterprises (GB12348-90), noise protection distance within the plant area of the Project is 62 m. Currently, no targets sensitive to noises exist in the area and new establishment of noise-sensitive targets is forbidden in the process of development and construction.

Waste water

Separate system is adopted by the Project for residential waste water. Residential waste water (2.4 m³/d) will be used for watering the plants in the plant area after contact oxidation process treatment; rain will be directly discharged into Majia River by the drainage pump of the plant.

Waste water containing oil will be recycled after proper disposal; other industrial waste water will be discharged into Majia River after being collected in the sewer for industrial waste water. Annual discharge of waste water generated by the Project is 261.3 thousand m³, and various pollutants index satisfy the Category 1 standard of Integrated wastewater discharge standard. COD concentration of the waste water is only 30 mg/L, meaning the water quality is far better than that of Majia River.

Solid waste

Ash resulting from combustion of fuels by the Project will be used as fertilizers in the farmland of the Project location, which not only reduces the burden on farmers, but also achieves the integrated utilization of ash. Annual generation by the Project of residential garbage is 13.75 t, which will be disposed by the environmental sanitation agencies and has little impact on the environment.

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

>>

According to the results of EIA and the reply from the Environmental Protection Bureau, the impacts on the environment are not significant.

SECTION E. Stakeholders' comments

>>

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

>>

From Jan., to Apr., 2006, assisted by the local government, to investigate the impacts on local ecological environment, the project owner carried out a survey of the local residents who might be affected by the project activities by delivering and collecting questionnaire.

Five staff delivered the questionnaires to the residents within Gaotang county randomly, especially the people living closed to the project and around the roads, where the transportation of the materials and equipments pass by. Following this way, 61 questionnaires were delivered, and the whole process of the delivery and collection of the questionnaires are completed until the middle of Apr, 2006.

Comments received through the survey are summarized as follows. The government of Gaotang County issued a support letter for the Project which is available for DNA and DOE.

E.2. Summary of the comments received:

The survey was conducted through delivering and collecting responses to a questionnaire. Totally 61 questionnaires returned out of 61 with 100% response rate. The basic structure of the respondents is illustrated in Table E-1.

Table E-1. Structure of the respondents

Structure of gender		
Gender	Number	Percentage (%)
Male	49	83.05
Female	10	16.95
Left blank	0	0

Structure of educational level		
Educational level	Number	Percentage (%)
Senior high school and higher	11	18.64
Junior high school	38	64.41
Elementary school	6	10.17
Left blank	4	6.78

Structure of age		
Age	Number	Percentage (%)
30 and younger	15	25.43
31~40	29	49.15
41~50	11	18.64
51~60	4	6.78

It can be seen that respondents are adequately representative in terms of gender, age and educational level, and their attitudes towards the impacts of the Project can be a comprehensive reflection of the attitudes of the residents possibly affected by the Project. Of the 61 respondents:

- 57 respondents (96.62%) support the construction of the Project, 1 respondent (1.69%) holds a neutral attitude and 1 respondent (1.69%) leaves the question unanswered.
- Respondents consider that positive impacts possibly caused by the construction of the Project include increased income (94.9%), reduction of air pollutants emission from decay and uncontrolled burning of biomass residues (81.36%), increased employment opportunities (64.4%) and improved living standards (67.8%).
- A few respondents are concerned that construction of the Project might cause a reduction of water supply (15.25%), an increase of fuel price (13.56%), increase of noise (5.08%), increase of environment pollutions (5.08%) and land occupation (1.69%).

The public investigation shows that the government and authorities at all levels support the project construction actively, confirm its social and environmental benefits, and wish the construction could be started early and accelerated. The project probably will lead to some concerns, but all concerns can be explained or solved in a reasonable way.

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

>>

The residents and local government are all very supportive of the Project. The Project owner has taken full consideration of the comments and suggestions given by stakeholders during preparation of the Project, therefore there has been no need to modify the Project due to the comments received.

Based on the concern of few respondents, the following aspects have been given consideration by the Project:

- Water source of the Project is the Nanwang Reservoir and back up water source for the Project is the underground water of the Project site. Since the remaining water source of the Nanwang Reservoir after the water demand from agriculture users and industry users are satisfied is about 3.6 times the water demand of the Project, and the underground water employed by the Project has been basically unexploited before³⁶, the implementation of the Project will not reduce the water supply of the Project location;
- Major fuel employed by the Project is biomass residues, and light diesel oil is for start-up only which results in very low consumption, thus the Project will not impact the fuel price in the local area.
- Complete noise protection measures have been designed in the Project, and both the normal operation and steam discharge process by the boilers of the Project satisfy the Category 2 standard of Standard of environmental noise of urban area (GB3096-93), which have very little impact on the surrounding sensitive targets and basically will not impact the life of local residents.³⁷
- As mentioned in D.1, emission of various pollutants from the Project satisfy or surpass the national standards, which can effectively reduce the impacts of unorganized low-altitude emissions resulting from combusting straw on the environment and contribute to the improvement of regional environmental status.
- Design of compact layout will be adopted by the Project, and the space between buildings and the width of pipeline aisle of the Project will be reduce as possible to reduce land occupation.

36 Approval by Gaotang County Water Authority on water use application by National Bio Energy Biomass Power Generation Project, Document No. Gaoshuizi[2006]4.

37 Environmental Impact Statement Form of the Project.

**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for the project.



ANNEX 3 BASELINE INFORMATION

Table An3-1. Installed capacities of North China Grid (2001)

	Hydro	Coal	Nuclear	Other	Total
Beijing	1058.1	3412.5	0	0	4470.6
Tianjin	5	5632	0	0	5637
Hebei	742.6	16474.9	0	0	17217.5
Shanxi	795.9	13415.9	0	0	14211.8
Shandong	56.2	20957.7	0	0	21013.9
Inner Mongolia	566.2	8898.3	0	0	9464.5
Total	3224	68791.3	0	0	72015.3

Data Source: China Electric Power Yearbook 2002, P616

Table An3-2. Installed capacities of North China Grid (2002)

2002	Hydro	Coal	Nuclear	Other	Total
Beijing	1038.5	3407.5	0	0	4446
Tianjin	5	6245.5	0	0	6250.5
Hebei	775.9	16745.7	0	13.5	17535.1
Shanxi	795.3	14328	0	0	15123.3
Shandong	50.8	24301.6	0	0	24352.4
Inner Mongolia	592.1	9778.7	0	76.6	10447.4
Total	3257.6	74807	0	90.1	78154.7

Data Source: China Electric Power Yearbook 2003, P593

Table An3-3. Installed capacities of North China Grid (2003)

2002	Hydro	Coal	Nuclear	Other	Total
Beijing	1058.1	3347.5	0	0	4405.6
Tianjin	5	6008.5	0	0	6013.5
Hebei	764.3	17698.7	0	13.5	18476.5
Shanxi	795.7	15035.8	0	0	15831.5
Shandong	50.8	30494.4	0	0	30545.2
Inner Mongolia	592.1	11421.7	0	76.6	12090.4
Total	3266	84006.6	0	90.1	87362.7

Data Source: China Electric Power Yearbook 2004, P709

Table An3-4. Installed capacities of North China Grid (2004)

2002	Hydro	Coal	Nuclear	Other	Total
Beijing	1055.9	3458.5	0	0	4514.4
Tianjin	5	6008.5	0	0	6013.5
Hebei	783.8	19932.7	0	13.5	20730
Shanxi	787.3	17693.3	0	0	18480.6
Shandong	50.8	32860.4	0	12.3	32923.5
Inner Mongolia	567.9	13641.5	0	111.7	14321.1
Total	3250.7	93594.9	0	137.5	96983.1

Data Source: China Electric Power Yearbook 2005, P473



Table An3-5 Calculation of simple OM emission factor of the North China Grid (2002)

Fuel types	unit	Provinces in the Regional Grid						Subtotal	Effective CO2 Emission Factor	average low Caloric value	CO ₂ emission
		Beijing	Tianjin	Hebei	Shanxi	Shandong	Inner mongolia		(tCO ₂ /TJ)	(MJ/t,m ³ ,tce)	(tCO ₂ e)
		A	B	C	D	E	F	F=A+B+C+D+E+F	G	H	=F*G*H
raw coal	Mtons	6.9184	10.5274	49.8801	40.3739	51.6286	32.18	191.5084	94.6	20908	378783851.5
cleaned coal	Mtons	0	0	0	0	0.8071	0	0.8071	94.6	26344	2011408.131
other washed coal	Mtons	0.0343	0	0.652	1.3556	1.0632	0	3.1051	94.6	8363	2456568.193
coke	Mtons	0	0	0	0	0	0	0	94.6	28435	0
coke oven gas	Mm ³	17	171	0	75	4	16	283	44.4	16.726	210165.5352
other coal gas	Mm ³	1582	0	734	0	0	1035	3351	44.4	5.227	777696.0588
crude oil	Mtons	0	0	0	0	0.1498	0	0.1498	73.3	41816	459153.8974
gasoline	Mtons	0	0	0	0	0.0065	0	0.0065	69.3	43070	19400.8815
kerosene	Mtons	0	0	0	0	0	0	0	71.5	43070	0
diesel oil	Mtons	0.0026	0.0235	0.0412	0	0.1002	0.016	0.1835	74.1	42652	579954.1722
fuel oil	Mtons	0.1394	0.0004	0.0122	0	0.2033	0.0042	0.3595	77.4	41816	1163542.745
LPG	Mtons	0	0	0	0	0	0	0	63.1	50179	0
Refinery gas	Mtons	0	0	0.0027	0	0	0	0.0027	57.6	46055	7162.4736
Natural gas	Mm ³	0	55	0	0	0	2	57	56.1	38.931	124489.6587
other petroleum products	Mtons	0	0	0	0	0	0	0	73.3	41816	0
other coking products	Mtons	0	0	0	0	0	0	0	107	29271.2	0
fired electricity generated	TWh	16.464063	25.33278	94.184816	75.691971	115.7314	47.3074074	374.7124374			
electricity imported	TWh							2.918		Total tCO ₂ e Emission	386593393.3
Result	a. total CO ₂ emission in North China Grid(tCO ₂ e)										386593393.3
	b. total generatoin in North China Grid(TWh)										377.6304374
	c. OM emission factor (tCO ₂ /MWh) (a/b/10 ⁶)										1.023734728
Data Source	Effective CO ₂ Emission Factor: 2006 IPCC Guidelines for National Greenhouse Gas Inventories										
	Fuel Consumption ,Fire Generated Electricity Data and Average Low Caloric Value: China Energy Statistical Yearbook										
	Electricity Imported: China Electric Power Yearbook										



Table An3-6 Calculation of simple OM emission factor of the North China Grid (2003)

Fuel types	unit	Provinces in the Regional Grid						Subtotal	Effective CO ₂ Emission Factor (tCO ₂ /TJ)	average low Caloric value (MJ/t,m ³ , tce)	CO ₂ emission (tCO ₂ e)	
		Beijing	Tianjin	Hebei	Shanxi	Shandong	Inner Mongolia					
		A	B	C	D	E	F	$F=A+B+C+D+E+F$	G	H	$=F*G*H$	
raw coal	Mtons	7.1473	10.5274	54.8264	45.2851	68.08	39.4932	225.3594	94.6	20908	445737636.1	
cleaned coal	Mtons	0	0	0	0	0.0941	0	0.0941	94.6	26344	234510.5998	
other washed coal	Mtons	0.0631	0	0.6728	2.0821	4.509	0	7.327	94.6	8363	5796681.315	
coke	Mtons	0	0	0	0	0	0.028	0.028	94.6	28435	75318.628	
coke oven gas	Mm ³	24	171	0	9	2	21	227	44.4	16.726	168578.0088	
other gas	Mm ³	1692	0	1063	0	156	1032	3943	44.4	5.227	915086.7084	
crude oil	Mtons	0	0	0	0	0.2968	0	0.2968	73.3	41816	909725.479	
Gasoline	Mtons	0	0	0	0	0.0001	0	0.0001	69.3	43070	298.4751	
Kerosene	Mtons	0	0	0	0	0	0	0	71.5	43070	0	
Diesel Oil	Mtons	0.0029	0.0135	0.04	0	0.054	0.0291	0.1395	74.1	42652	440891.5914	
fuel oil	Mtons	0.1395	0.0002	0.0111	0	0.1007	0.0065	0.258	77.4	41816	835032.0672	
LPG	Mtons	0	0		0	0	0	0	63.1	50179	0	
Refinery gas	Mtons	0	0	0.0027	0	0.0083	0	0.011	57.6	46055	29180.448	
Natural gas	Mm ³	0	50	0	0	108	0	158	56.1	38.931	345076.5978	
Other Petroleum Products	Mtons	0	0	0	0	0	0	0	73.3	41816	0	
Other Coking Products	Mtons	0	0	0	0	0	0	0	107	29271.2	0	
fired electricity generated	TWh	17.20867 84	30.00523 11	101.2240 35	86.736322 2	130.0717 59	60.11888 04	425.3649058		Total	455488016	
electricity imported	TWh							4.244				
Result	a. total CO ₂ emission in North China Grid(tCO ₂ e)									455488016		
	b. total generatoin in North China Grid(TWh)									429.6089058		
	c. OM emission factor		(a/b/10 ⁶)							1.060238766		



	(tCO ₂ /MWh))							
Data Source	Effective CO ₂ Emission Factor: 2006 IPCC Guidelines for National Greenhouse Gas Inventories								
	Fuel Consumption ,Fire Generated Electricity Data and Average Low Caloric Value: China Energy Statistical Yearbook								
	Electricity Imported: China Electric Power Yearbook								

Table An3-7 Calculation of simple OM emission factor of the North China Grid (in 2004)

Fuel types	unit	Provinces in the Regional Grid						Subtotal	Effective CO ₂ Emission Factor	average low Caloric value	CO ₂ emission
		Beijing	Tianjin	Hebei	Shanxi	Shandong	Inner mongolia				
		<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>F=A+B+C+D+E+F</i>	(tCO ₂ /TJ)	(MJ/t,m ³ ,tce)	(tCO ₂ e)
		<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>F=A+B+C+D+E+F</i>	<i>G</i>	<i>H</i>	<i>=F*G*H</i>
raw coal	Mtons	8.2309	14.1	62.998	52.13	85.5	49.322	272.2809	94.6	20908	538543520.8
cleaned coal	Mtons	0	0	0	0	0.4	0	0.4	94.6	26344	996856.96
other washed coal	Mtons	0.0648	0	1.0104	3.5417	2.8422	0	7.4591	94.6	8363	5901190.882
coke	Mtons	0	0	0	0	0	0.0022	0.0022	94.6	28435	5917.8922
coke oven gas	Mm ³	55	0	54	532	873	40	1554	44.4	16.726	1154053.858
other gas	Mm ³	1774	0	2425	820	141	1647	6807	44.4	5.227	1579760.392
crude oil	Mtons	0	0	0	0	0	0	0	73.3	41816	0
Gasoline	Mtons	0	0	0	0	0	0	0	69.3	43070	0
Kerosene	Mtons	0	0	0	0	0	0	0	71.5	43070	0
Diesel Oil	Mtons	0.0039	0.0084	0.0466	0	0	0	0.0589	74.1	42652	186154.2275
fuel oil	Mtons	0.1466	0	0.0016	0	0	0	0.1482	77.4	41816	479657.9549
LPG	Mtons	0	0	0	0	0	0	0	63.1	50179	0
Refinery gas	Mtons	0	0.0055	0.0142	0	0	0	0.0197	57.6	46055	52259.5296
Natural gas	Mm ³	0	37	0	19	0	2	58	56.1	38.931	126673.6878
Other Petroleum Products	Mtons	0	0	0	0	0	0	0	73.3	41816	0
Other Coking Products	Mtons	0	0	0	0	0	0	0	107	29271.2	0
fired electricity generated	TWh	17.10383	31.79605	116.847	96.846698	151.9192024	74.6603841	489.1731099		Total	549026046.2
electricity imported	TWh							4.5			



* SCE: Standard Coal Equivalent

Table An3-10 Incremental installed capacity from 2001 to 2004

TABLE A3	A	B	C	D	E	F	G	H	K	L
	Installed Capacity 2001	Installed Capacity 2002	Installed Capacity 2003	Installed Capacity 2004	New Capacity Additions 2004-2002	Split of New Capacity	New Capacity Additions 2004-2001	Split of New Capacity	Emissions Factor	Weighted Average Build Margin Emissions Factor
	MW	MW	MW	MW	MW	%	MW	%	tCO ₂ /MWh	tCO ₂ /MWh
					=D-B		=D-A			= H * K
Hydro	3224.0	3257.6	3,266.0	3,250.7	-6.9	-0.04%	26.7	0.11%	0.000	0.000
Coal	68791.3	74807.0	84,006.6	93,594.9	18,787.9	99.78%	24,803.6	99.34%	0.886	0.880
Nuclear	0.0	0.0	0.0	0.0	0.0	0.00%	0.0	0.00%	0.000	0.000
Other (wind)	0.0	90.1	90.1	137.5	47.4	0.25%	137.5	0.55%	0.000	0.000
Total / % Change	72015.3	78154.7	87362.7	96983.1	18,828.4	19.4%	24,967.8	25.7%		0.880



Table An3-11 Calculation of combined emission factor

OM Factor(tCO₂e/MWh)	BM Factor (tCO₂e/MWh)	Combined Emission Factor* (tCO₂e/MWh)
1.069	0.880	0.975

***Combined Emission Factor =0.5* OM+0.5*BM**



Annex 4

MONITORING INFORMATION

No additional information



Annex 5
Re-assessment of additionality



Series	Account Title	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	Net cash inflow	172227		9526	9526	9526	9526	9526	9526	9526	9526	9526	9526	9526	9526	9526	9526	9526	5517	5517	5517	5517	7277
1.1	Sales revenue	170467		9526	9526	9526	9526	9526	9526	9526	9526	9526	9526	9526	9526	9526	9526	9526	5517	5517	5517	5517	5517
1.2	Disposal of assets	1416																					1416
1.3	Return of floating capital	344																					344
2	Net cash outflow	193078	28868	8339	8211	8211	8211	8211	8211	8211	8211	8211	8211	8211	8211	8211	8211	8227	8179	8179	8179	8179	8179
2.1	Capital Assets Investment	29096	28514	582																			
2.2	Floating capital	339	354	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1					
2.3	Operating Costs	162209		7679	8133	8133	8133	8133	8133	8133	8133	8133	8133	8133	8133	8133	8133	8133	8133	8133	8133	8133	8133
2.4	Taxes (City, Education, Income tax)	1419		79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	46	46	46	46	46
2.5	Legal reserve	15		0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0
3	Net cash flow(Without CERs revenue)	-20850	28868	1187	1314	1314	1314	1314	1314	1314	1314	1314	1314	1314	1314	1314	1314	1299	-2663	2663	2663	2663	-903
4	Net cash flow(With CERs revenue)		28868	2540	2667	2667	2667	2667	2667	2667	2667	2667	2667	2667	2667	2667	2667	2652	-1310	1310	1310	1310	450

Note: revised sections have been highlighted
Please see the sheet“IRR comparison and Emission Reduction Calculation Spreadsheet” for calculation details.

