



**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:**

Jilin Liaoyuan 50MW Level Biomass Cogeneration Project

Version: 09

Date: 24/05/2010

Revision history of this document:

| Version Number | Date       | Description                                                                              |
|----------------|------------|------------------------------------------------------------------------------------------|
| 01             | 18/11/2006 | Internal Draft Version                                                                   |
| 02             | 26/01/2007 | PDD submitted to DNA for LOA                                                             |
| 03             | 09/04/2007 | PDD submitted for GSP                                                                    |
| 04             | 31/08/2007 | PDD revised to address DOE's comments based on the document review and on-site interview |
| 05             | 13/12/2007 | PDD prepared for request for registration                                                |
| 06             | 13/02/2008 | PDD prepared for 2 <sup>nd</sup> GSP because of Methodology Version Changing             |
| 07             | 03/08/2008 | PDD prepared for request for registration after 2 <sup>nd</sup> GSP.                     |
| 08             | 15/02/2010 | PDD prepared for registration following review.                                          |
| 09             | 14/05/2010 | PDD prepared for notification                                                            |

**A.2. Description of the project activity:**

The proposed Jilin Liaoyuan 50MW Biomass Cogeneration Project (hereafter referred to as the Project) is located in Liaoyuan City, Jilin province. Liaoyuan City, with rich agricultural resources, is one of the biggest agriculture bases in the middle-south of Jilin province. The implementation of the proposed 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 (mainly as maize stalk) for generating heat and electricity. The install capacity is 30MW. The proposed project has installed one straw-fired boiler imported from Denmark BWE Company, which is a world leading company in biomass boilers production and biomass cogeneration. The proposed project has also installed a set of turbine and generator, which are produced domestically. The proposed project has also constructed 3 individual straw collection stations within a 40km radius around the plant. Further details on the equipments are provided in A.4.3. The proposed project will assist in transferring advanced biomass technology to China. It is estimated that the Project can deliver 190.2 GWh of electricity to the Northeast China Grid and supply 0.75 million GJ of heat to Longshan Industrial Development Zone per year, which consume nearly 297,341 tons maize stalk. The designed overview of the proposed project is demonstrated as Figure A-1.

The pre-project situation and the baseline scenario are identical: the electricity is produced within the Northeast China Grid, heat to supply consumers of Liaoyuan Industrial Development Zone is produced from burning fossil fuel, and straw is dumped or left for to decay in an uncontrolled manner.

When the proposed project is put into operation, it will produce and claim GHG emission reductions from:

- displacing electricity that would otherwise be produced to supply the high-growth,

- coal-dominated power generation of Northeast China Grid, avoiding CH<sub>4</sub> emissions because the biomass is dumped or left to decay or burned in an uncontrolled manner in the absence of the proposed project.

The proposed project will not claim GHG emission reductions from displacing heat that would otherwise be produced within Longshan Industrial Development Zone.

The estimated annual GHG emission reductions are 190,139tCO<sub>2</sub>e.



**Figure A-1 Designed Overview of the on-site of the proposed project**

The decision to develop Liaoyuan biomass project and organize NBE teams in order to secure the CDM status was taken by NBE parent company on November 28th 2005. Contractual negotiations with CER buyers were already started in December 2005. The project received encouragement from Liaoyuan County to be developed as a CDM project on January 12<sup>th</sup> 2006. The boiler purchase agreement for the project was signed on February 8<sup>th</sup> 2006. The project was approved by Jilin Provincial Development and Reform Commission on 20 March, 2006. The decision to definitively proceed with the project was confirmed at the 1<sup>st</sup> Board meeting of NBE Liaoyuan Co. Ltd (the project company) on March 28<sup>th</sup> 2006. The turbine and generator purchase agreements were signed on May 15<sup>th</sup> 2006 and June 6<sup>th</sup> 2006. The project started construction on 28 June 2006 (construction start ceremony). The validation of the project started on April 19<sup>th</sup> 2007 and the power production line was commissioned on November 30th, 2007, only producing electricity.

The project will contribute to the sustainable development in the region as list in following aspects:

- By using maize stalk as fuels for power generation, saving the amount of coal use and making the straws 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 straws burning can be used as ash fertilizer, which will amount to over 16,064 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 straw purchase, straw transport and straw storage.
- The project will reduce GHG emissions compared to a business-as-usual scenario.

In a word, the proposed 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.

**A.3. Project participants:**

| Name of Party involved<br>(*)(host) indicates a<br>host Party)                                                                                                                                                                                                                          | Private and/or public entity(ies)<br>project participants (*)<br>(as applicable) | Kindly indicate if the<br>Party involved<br>wishes to be considered<br>as<br>project participant<br>(Yes/No) |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| People's Republic of<br>China (host)                                                                                                                                                                                                                                                    | National Bio Energy Co., Ltd <sup>1</sup> .                                      | 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:**

>>

**A.4.1.1. Host Party(ies):**

People's Republic of China

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

Jilin Province

<sup>1</sup> It is hereafter referred as 'NBE'.

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

Dashou Village, Shoushan Town, Longshan Industrial Development Zone, Liaoyuan City

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

Liaoyuan City lies in the middle-south of Jilin province. The project site is located in Longshan Industrial Development Zone, which is 10 kilometres from the central area of Liaoyuan City. The Project has geographical coordinates with east longitude of 125°15'23'' and north latitude of 42°55'24'' and with a Mail Address: National-Liaoyuan Bio Energy Co., Ltd, Renao Street, Shoushan Town, Longshan Industrial Development Zone, Liaoyuan City; Postal Code: 136200. Geographical location of the project is shown in Figure A-1 and Figure A-2.



**Figure A-1: Location of the Jilin Province in China**



Figure A-2: Location of the proposed 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 proposed project will install the Straw Direct Burning boiler of 1×130t/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                  |
|----------------------------------|------|------------------------|
| Type of Boiler                   | /    | Back pressure turbines |
| 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 Efficiency                     | %     | ≥92             |
| Boiler Exhaust Temperature            | °C    | 130             |
| Boiler Dirt-discharge Rate            | %     | 2               |
| boiler fire fuel                      | /     | Diesel          |
| Age                                   | years | 0 (new turbine) |
| Expected lifetime (industry standard) | years | 30              |

Other two key equipments are turbine and generator, technologies of which are all developed by domestic manufacturers (respectively Qingdao Jieneng Steam Turbine Group Co.,Ltd. and Shandong Jinan Power Generation Equipment Plant). 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                                 | /     | C30-8.83/0.981  |
| Rated Output                          | MW    | 30              |
| Rated Rotation Speed                  | r/min | 3000            |
| Rated Flow of main steam              | t/h   | 110             |
| Rated Pressure of main steam          | MPa   | 8.83            |
| Rated Temperature of main steam       | °C    | 535             |
| Efficiency                            | %     | 81%             |
| Age                                   | years | 0 (new turbine) |
| Expected lifetime (industry standard) | years | 30              |

**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     | 3437            |
| Rated Rotation Speed                  | r/min | 3000            |
| Efficiency                            | %     | ≥97.6%          |
| Age                                   | years | 0 (new turbine) |
| Expected lifetime (industry standard) | years | 30              |

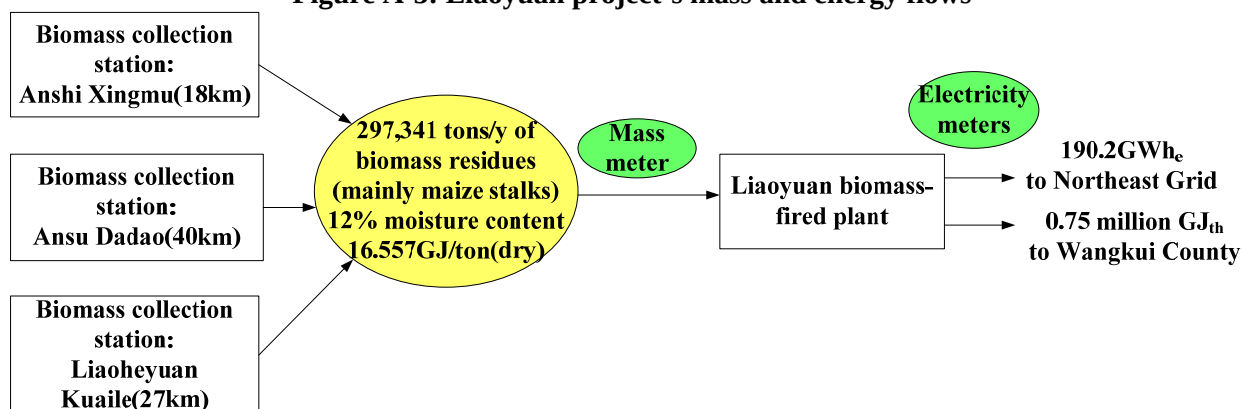
Fuel supply system is another very important technical system of the project. In order to guarantee the fuel supply of the project, 3 individual stalk collection stations around the project site are constructed. The farmers sell their maize stalk in the nearest stalk collection, which will be cut into pieces, bundled regularly and transported to the project site. The names of 3 individual stalk collection stations and whose main information to the project is 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) | Average stored volumes (ton) | Maximal storage time (day) |
|-------------|-------------------|--------------------------------------------------|------------------------------|----------------------------|
| 1           | Anshi Xingmu      | 18                                               | 20,000                       | 25                         |
| 2           | Ansu Dadao        | 40                                               | 20,000                       | 25                         |
| 3           | Liaoheyuan Kuaile | 27                                               | 20,000                       | 25                         |

The transportation of the maize stalk from the individual stalk collection stations to the project site would be sub-contracted by the project entity with local logistics firm.

As shown on Figure A-3, the project will consume nearly 297,341 tons biomass residues (mainly maize stalk) per year, and will deliver 190.2 GWh of electricity to the Northeast China Grid and supply 0.75 million GJ of heat to Longshan Industrial Development Zone per year. In the absence of the project activity, this electricity would have continued to be supplied by the Northeast China Grid and the heat would have continued to be supplied through burning fossil fuels.

**Figure A-3: Liaoyuan project's mass and energy flows**

The location of the main monitoring equipments within the project activity is displayed in Figure A-3, while the monitoring plan and procedures are detailed precisely in paragraph B.7. Mass meters will be of type SCS-30 and will undergo maintenance according to national standards like JJG907-2003. Electricity meters will have an accuracy of 0.2%. The proposed project will not claim GHG emission reductions from displacing heat.

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

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

The project activity is expected to generate an estimated annual emission reduction of 190,139 tCO<sub>2</sub>e and 1,330,973 tCO<sub>2</sub>e during the first crediting period of the project.



| Year                                                                                 | Annual estimation of emission reductions(tCO <sub>2</sub> e) |
|--------------------------------------------------------------------------------------|--------------------------------------------------------------|
| 10/07/2009~09/07/2010                                                                | 190,139                                                      |
| 10/07/2010~09/07/2011                                                                | 190,139                                                      |
| 10/07/2011~09/07/2012                                                                | 190,139                                                      |
| 10/07/2012~09/07/2013                                                                | 190,139                                                      |
| 10/07/2013~09/07/2014                                                                | 190,139                                                      |
| 10/07/2014~09/07/2015                                                                | 190,139                                                      |
| 10/07/2015~09/07/2016                                                                | 190,139                                                      |
| Total estimated reductions(tCO <sub>2</sub> e) during the first crediting period     | 1,330,973                                                    |
| Total number of crediting years                                                      | 7                                                            |
| Annual average of estimated reductions over the crediting period(tCO <sub>2</sub> e) | 190,139                                                      |

**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 proposed project activity is ACM0006 (Version 06.2) – “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:

- Version 02.2 of combined tool to identify the baseline scenario and demonstrate additionality.
- Version 1 of Tool to calculate baseline, project and/or leakage emissions from electricity consumption.
- Version 2 of Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion.
- Version 07 of ACM0002: Consolidated baseline and monitoring methodology for grid-connected electricity generation from renewable sources.

**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 proposed project is a new biomass residue fired cogeneration plant, which meets all above-mentioned applicability conditions of methodology ACM0006 because:

- Predominant fuels used by the proposed project are maize stalk;
- The maize stalk used by the proposed project are byproducts of agriculture crops, not from a production process;
- The straws are directly bought from the farmers at the temporary storage stations and the straws should not be stored for more than one year;
- Except from transportation of the straws, the proposed project has no significant consumption of fossil fuels.

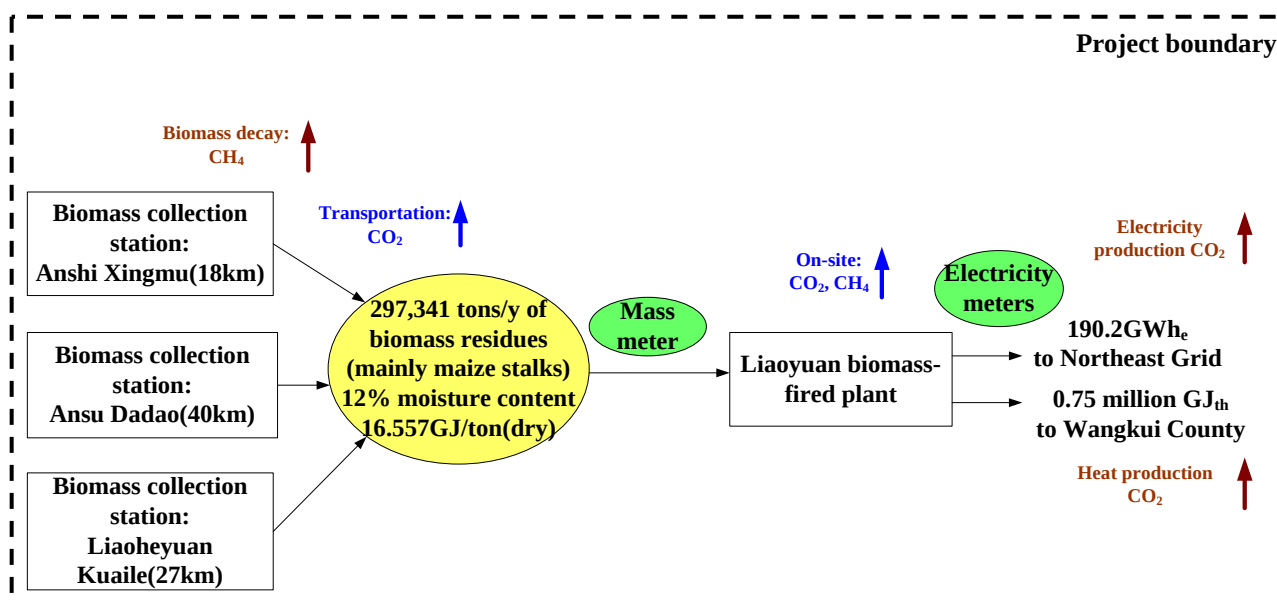
Therefore, the approved consolidated baseline methodology, ACM0006 are applicable to the proposed project.

|                                                                                   |
|-----------------------------------------------------------------------------------|
| <b>B.3. Description of the sources and gases included in the project boundary</b> |
|-----------------------------------------------------------------------------------|

According to the version 06 of ACM0006, the project boundary encompasses the power plant at the project site, sites where biomass residue would have been left to decay, the means for transportation of biomass to the project site, and all power plants connected physically to Northeast China Grid that the proposed project is 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 proposed project is connected to Northeast China Power Grid (including Liaoning Province, Jilin Province and Heilongjiang Province).



**Figure B-1: Flow diagram of the project boundary, including gas emissions from the baseline (brown) and from the project activity (blue)**



In this PDD, CH<sub>4</sub> emissions will be included for both project and baseline emissions. According to 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 <sub>2</sub>  | Yes       | Main emission source                                                                                                                    |
|          |                                                                                                  | CH <sub>4</sub>  | No        | Excluded for simplification. This is conservative.                                                                                      |
|          |                                                                                                  | N <sub>2</sub> O | No        | Excluded for simplification. This is conservative.                                                                                      |
|          | Heat generation                                                                                  | CO <sub>2</sub>  | Yes       | Main emission source                                                                                                                    |
|          |                                                                                                  | CH <sub>4</sub>  | No        | Excluded for simplification. This is conservative.                                                                                      |
|          |                                                                                                  | N <sub>2</sub> O | No        | Excluded for simplification. This is conservative.                                                                                      |
|          | Uncontrolled burning or decay of Surplus biomass                                                 | CO <sub>2</sub>  | No        | It is assumed that CO <sub>2</sub> emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector. |
|          |                                                                                                  | CH <sub>4</sub>  | Yes       | B1 is the most likely baseline scenario.                                                                                                |
|          |                                                                                                  | N <sub>2</sub> 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 <sub>2</sub>  | Yes | Included as emission sources by project activity                                                                                          |
|                  |                                                                                                    | CH <sub>4</sub>  | No  | Excluded for simplification. This emission source is assumed to be very small.                                                            |
|                  |                                                                                                    | N <sub>2</sub> O | No  | Excluded for simplification. This emission source is assumed to be very small.                                                            |
|                  | Off-site transportation of biomass residues                                                        | CO <sub>2</sub>  | Yes | Included as emission sources by project activity                                                                                          |
|                  |                                                                                                    | CH <sub>4</sub>  | No  | Excluded for simplification. This emission source is assumed to be very small.                                                            |
|                  |                                                                                                    | N <sub>2</sub> O | No  | Excluded for simplification. This emission source is assumed to be small.                                                                 |
|                  | Combustion of biomass residues for electricity and / or heat generation                            | CO <sub>2</sub>  | No  | It is assumed that CO <sub>2</sub> emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.            |
|                  |                                                                                                    | CH <sub>4</sub>  | Yes | CH <sub>4</sub> emissions will be caused during the course of power/heat generation.                                                      |
|                  |                                                                                                    | N <sub>2</sub> O | No  | Excluded for simplification. This emission source is assumed to be small                                                                  |
|                  | Biomass storage                                                                                    | CO <sub>2</sub>  | No  | It is assumed that CO <sub>2</sub> emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.   |
|                  |                                                                                                    | CH <sub>4</sub>  | No  | Excluded for simplification. Since biomass residues are stored for not longer than one year, this emission source is assumed to be small. |
|                  |                                                                                                    | N <sub>2</sub> O | No  | Excluded for simplification. This emissions source is assumed to be very small.                                                           |
|                  | Waste water from the treatment of biomass residues                                                 | CO <sub>2</sub>  | No  | It is assumed that CO <sub>2</sub> emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.   |
|                  |                                                                                                    | CH <sub>4</sub>  | No  | This emission source is not included as the waste water is not treated under anaerobic conditions.                                        |
|                  |                                                                                                    | N <sub>2</sub> O | No  | Excluded for simplification. This emission source is assumed to be small.                                                                 |

**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 proposed 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                                                                                                                                                                                                                                                      |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>P1</b> | The proposed project activity not undertaken as a CDM project activity                                                                                                                                                                                                                                                                                                                                | Yes       | It seems to be a plausible alternative without considering the investment analysis.                                                                                                                                                                                            |
| <b>P2</b> | The continuation of power generation in an existing biomass residue fired power plant at the project site, in the same configuration, without retrofitting and fired with the same type of biomass residues as (co-)fired in the project activity.                                                                                                                                                    | No        | There is no existing biomass residue fired power plant at the project site. Therefore, Alternative P2 is not realistic.                                                                                                                                                        |
| <b>P3</b> | The generation of power in an existing captive plant, using only fossil fuels                                                                                                                                                                                                                                                                                                                         | No        | There are two fossil fuel fired power plants in Liaoyuan, however, they can not meet the increasing electricity demand of local areas <sup>2</sup> . So P3 is excluded.                                                                                                        |
| <b>P4</b> | The generation of power in the grid                                                                                                                                                                                                                                                                                                                                                                   | Yes       | The generation of power from Northeast China Grid will meet the requirement of national laws and regulations, also financially viable. Hence, the Alternative P4 is a feasible alternative.                                                                                    |
| <b>P5</b> | The installation of a <b>new</b> biomass residue fired power plant, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case. | No        | At present, the technology of biomass cogeneration just starts, even if the biomass power plants with lower power generation efficiency are not common practice in China. Therefore, Alternative P5 can't become the most realistic baseline alternative for power generation. |
| <b>P6</b> | The installation of a <b>new</b> biomass residue fired power plant that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity                                                                                                                                                                        | No        | At present, the technology of biomass cogeneration just starts, and biomass power plants with lower power generation efficiency are not common practice in China. Therefore, Alternative P6 can't become the most realistic                                                    |

<sup>2</sup> The Electricity Balance Table of Liaoyuan in the Feasibility Study Report of the proposed project.



|           |                                                                                                                                                                                                                                                                                                                                                                                                       |    |                                                                                                                                     |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-------------------------------------------------------------------------------------------------------------------------------------|
|           | generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity. Therefore, the power output is the same as in the project case.                                                                                                                                                                                                                    |    | baseline alternative for power generation.                                                                                          |
| <b>P7</b> | The <b>retrofitting</b> of an existing biomass residue fired power, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case. | No | There is no existing biomass residue fired power plant at the project site. Therefore, Alternative P7 is not realistic.             |
| <b>P8</b> | The <b>retrofitting</b> of an existing biomass residue fired power that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity.                                                     | No | There is no existing biomass residue fired power plant at the project site. Therefore, Alternative P8 is not realistic.             |
| <b>P9</b> | The installation of a <b>new</b> fossil fuel fired captive power plant at the project site.                                                                                                                                                                                                                                                                                                           | No | There is no project to add a new fossil fuel fired captive power plant at the project side. There, alternative P9 is not realistic. |

As analyzed above, Alternative P1 and Alternative P4 are considered as plausible baseline scenarios. However, according to the barrier analysis in the latter step, the proposed project activity not undertaken as a CDM project activity will prevent the implementation of the proposed project activity. So P1 has to be excluded. Therefore, the most plausible baseline scenario for power generation is the Alternative P4.

## 2. Use of biomass

The proposed project mainly uses biomass residues from maize stalks. The project may also use some biomass residues from soybean stalk. Without the proposed project activity, the baseline scenario is that a huge amount of straws are left unused in local area annually. According to statistic data from investigation group constituted by Liaoyuan Longshan District Government, Liaoyuan Wuyi Corporation and Liaoyuan Agriculture Bureau (as also quoted in the FSR), maize and soybean planting area within 50 km around the Project site have reached 130,745 hectare and 34,005 hectare respectively, with annual maize and corn stalks outputs of 1,328,558 tons and 105,569 tons respectively. Prior to the implementation of the Project, except that part of the maize stalks was utilized as fuels and forage by the farmers, 863,563 tons of maize stalks and 68,620 tons of soybean stalks were left in the field to natural decay or burnt in an uncontrolled manner, which means 464,995 tons of maize straw and 36,949 tons of soybean straw were used per year.

Detailed analyses on each alternative are summarized in Table B-3.



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

| Series    | Alternative                                                                                                                                                                                                                                         | Included? | Justification/Explanation                                                                                                                                                                                                                                                                                    |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>B1</b> | 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       | Around the site of the proposed project, a certain number of surplus biomass residues would be dumped or left to decay. Alternative B1 is a realistic baseline alternative for unused biomass.                                                                                                               |
| <b>B2</b> | The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to deep landfills with more than 5 meters. This does not apply to biomass residues that are stock-piled or left to decay on fields. | No        | There is no deep landfill with more than 5 meters around the site of the proposed project, hence, the unused biomass residues are impossible dumped or left to decay under clearly anaerobic conditions. Therefore, B2 is excluded.                                                                          |
| <b>B3</b> | The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes.                                                                                                                                                  | Yes       | Around the site of the proposed project, a certain number of surplus biomass residues would be burnt in an uncontrolled manner without utilizing it for energy purposes. Therefore, Alternative B3 is one realistic baseline alternative for unused biomass.                                                 |
| <b>B4</b> | The biomass residues are used for heat and/or electricity generation at the project site                                                                                                                                                            | No        | There is no heat or power generation project around at the project site that uses biomass residues as fuel. Therefore, B4 is excluded.                                                                                                                                                                       |
| <b>B5</b> | The biomass residues are used for power generation, including cogeneration, in other existing or new grid connected power plants                                                                                                                    | No        | There is no generation or cogeneration project using biomass residues as fuel close to proposed project. Considering the cost of biomass transportation, other existing or new grid-connected power plants will not use these surplus biomass residues. Therefore, B5 is excluded.                           |
| <b>B6</b> | The biomass residues are used for heat generation in other existing or new boilers at other sites                                                                                                                                                   | No        | There is no biomass boiler using biomass residues as fuel close to proposed project. Considering the cost of biomass transportation, other existing or new boilers at other places will not use these surplus biomass residues. So alternative B6 is not a realistic baseline alternative for unused biomass |
| <b>B7</b> | The biomass residues are used for other energy purposes, such as the generation of bio-fuels                                                                                                                                                        | No        | There is no other energy generation project that has needs to the surplus biomass residues consumed by the proposed project. Therefore, B7 is excluded.                                                                                                                                                      |
| <b>B8</b> | The biomass residues are used for non-energy purposes, e.g. as fertilizer or as feedstock in processes (e.g. in the pulp and                                                                                                                        | No        | Currently, There is no company using biomass residues for non-energy purpose around the project site such as fertilizer or as feedstock in processes. So alternative B8 is                                                                                                                                   |



|  |                 |  |           |
|--|-----------------|--|-----------|
|  | paper industry) |  | excluded. |
|--|-----------------|--|-----------|

As analyzed above, the most realistic and credible alternative for biomass use is B1 or B3.

### 3. Heat generation

Table B-4 Identifying the most plausible baseline scenario for Heat generation

| Series | Alternative                                                                                                                                                                                                                                                                             | Included? | Justification/Explanation                                                                                                                                                                                                                                                            |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| H1     | The Project not undertaken as a CDM project activity.                                                                                                                                                                                                                                   | Yes       | It seems to be a plausible alternative without considering the investment analysis.                                                                                                                                                                                                  |
| H2     | The Project (installation of a cogeneration power plant), fired with the same type of biomass residues but with a different efficiency of heat generation (e.g. an efficiency that is common practice in the relevant industry sector).                                                 | No        | At present, the technology of biomass power cogeneration 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. |
| H3     | The generation of heat in an existing cogeneration plant, on-site or nearby the project site, using only fossil fuels.                                                                                                                                                                  | No        | There exists no cogeneration power plant using only fossil fuels on-site or nearby the project site <sup>4</sup> . So alternative H3 is excluded.                                                                                                                                    |
| H4     | The generation of heat in boilers using the same type of biomass residues.                                                                                                                                                                                                              | No        | There is no biomass boiler using biomass residues as fuel close to proposed project <sup>4</sup> .                                                                                                                                                                                   |
| H5     | The continuation of heat generation in an existing cogeneration plant, fired with the same type of biomass residues as in the 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. | No        | There is no existing cogeneration plant at the end of the lifetime, fired with the same type of biomass residues                                                                                                                                                                     |
| H6     | The generation of heat in boilers using coal as fossil fuels.                                                                                                                                                                                                                           | Yes       | It is a plausible baseline scenario because using coal as fossil fuels for heating is common scenario in local areas <sup>3</sup> .                                                                                                                                                  |
| H7     | The use of heat from external sources, such as district heat.                                                                                                                                                                                                                           | No        | Same as Justification/Explanation for H3.                                                                                                                                                                                                                                            |
| H8     | Other heat generation technologies (e.g. heat pumps or solar energy).                                                                                                                                                                                                                   | No        | Heat demand from the specific heating supply region of the Project is mainly stable industrial heat load (accounting for 71.85% <sup>4</sup> of the heat supplied by the project), and requirement by industrial heat load on the                                                    |

<sup>3</sup> It is demonstrated that baseline is indeed coal, though the Investigate on Coal-fired boilers in Longshan Industrial Zone, which is evidenced in Chapter Heat Load Analysis (Page 7 to Page 13) in FSR report

<sup>4</sup> The feasibility study report of the Project.



|  |  |  |                                                                                                                                            |
|--|--|--|--------------------------------------------------------------------------------------------------------------------------------------------|
|  |  |  | temperature and pressure of heat is high, which can not be satisfied by other heat supply technologies such as solar energy or heat pumps. |
|--|--|--|--------------------------------------------------------------------------------------------------------------------------------------------|

As analyzed above, Alternative H1 and Alternative H6 could be considered as plausible baseline scenarios. However, according to the barrier analysis in the latter part, the proposed project activity not undertaken as a CDM project activity will be prevented from implementation due to the facing of investment barriers, technological barriers and lack of prevailing practice. So Alternative H1 has to be excluded. Therefore, the most realistic and credible alternative for heat generation is H6.

In conclusion, the scenario 2 is the most realistic baseline scenario.

Table B-5 Baseline Scenario

| Scenario | Project Type             | Baseline Scenario |                |                 |
|----------|--------------------------|-------------------|----------------|-----------------|
|          |                          | Power Generation  | Use of biomass | Heat Generation |
| 2        | Power Greenfield Project | P4                | B1 or B3       | H6              |

**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 CDM was seriously considered by NBE parent company and project company from the earliest stages. The implementation schedule demonstrating serious CDM consideration from the earliest project stages is summarized here after:

November 25th 2005: CDM consideration evidence in National Bio Energy parent company at board meeting launching the preparatory work for the development of the project (meeting minutes) and nominated the department in charge of the CDM development (meeting minutes provided to the DOE).

December 2005: Start of discussion with CER buyers (letter of intent provided to the DOE)

January 12th 2006: Letter of Intention from Liaoyuan County Government encouraging the project owner to develop the project as a CDM project

January 20th 2006: Creation of National Bio Energy Liaoyuan Co. Ltd. (business license)

February 8th 2006: Signature of a boiler purchase by NBE Liaoyuan Co. Ltd.

March 20th 2006: Project approval by Jilin Provincial Development and Reform Commission (FSR approval)

March 28th 2006: 1st Board meeting of NBE Liaoyuan Co. electing the Chairman of the Board and the CEO, and officialising at project company level the decision to proceed with the investment of Liaoyuan as a CDM project (meeting minutes provided to the DOE)



|                 |                                                                                                                                    |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------|
| May 15th 2006:  | Signature of the turbine purchase agreement                                                                                        |
| May 20th 2006:  | 3rd Board Meeting of National Bio Energy Liaoyuan Co., Ltd showing further CDM consideration (meeting minutes provided to the DOE) |
| June 6th 2006:  | Signature of the generator purchase agreement                                                                                      |
| June 28th 2006: | Construction start ceremony                                                                                                        |

The project uses the *combined tool to identify the baseline scenario and demonstrate additionality* (version 02.1), which was revised in the EB 28, to demonstrate its additionality. The tool includes the following steps:

#### **STEP 1. Identification of alternative scenarios**

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 alternative scenarios to the proposed CDM 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 analyses of each alternative above-mentioned are carried out in Section B.4.

**Outcome of Step 1a:** As it is discussed in Section B.4, there are two plausible alternative scenarios:

- the proposed project activity not undertaken as a CDM project activity (P1, H1)
- Business-as-usual: the supply of equivalent power generation by the Northeast China Grid (P4), the generation of heat in boilers using fossil fuels (H6), and the biomass residues continuing being dumped, left to decay or burnt in an uncontrolled manner (B1, B3).

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

As for power generation, P1 (The proposed project activity not undertaken as a CDM project activity) and P4 (Supply of equivalent power generation by the Northeast 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 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.

As for heat generation, H1 (proposed project activity not undertaken as a CDM project activity) and the Alternative H6 (generation of heat in boilers using fossil fuels), are consistent with related laws and



regulations in China.

**Outcome of Step 1b:** Based on the above analysis, the two alternative scenarios listed in the outcome of Step 1a are in line with the existing Chinese laws and regulations.

## STEP 2. Barrier analysis

### *Sub-step 2a. Identify barriers that would prevent the implementation of alternative scenarios:*

There are realistic and credible barriers that would prevent the implementation of the project activity not undertaken as a CDM project activity:

- Investment barriers:
  - similar activities had never been implemented in China at the time the decision to invest in the project was taken, even with grants or other non-commercial finance terms.
  - important fuel price risk: there is no possibility of securing long term biomass prices. Experience with Shandong Shiliquan straw mix with coal generation project, the 1st Chinese example of burning biomass in a commercial plant for electricity production, and which was commissioned in December 16<sup>th</sup> 2005 experienced fuel price increase from 100 RMB/t to 400 RMB/t within its straw collection radius in its first few weeks of operation, which leads to the significant over-costs compromising its economics<sup>5</sup>. The biomass residue collecting system has indeed organized in a way that farmers now stock the stalk in order to raise prices<sup>6</sup>.
- Technological barriers
  - Skilled and/or properly trained labour to operate and maintain the plant is not available in China, which leads to an unacceptably high risk of equipment disrepair, malfunctioning or other underperformance. Since the technology of biomass power generation in China has not been commercialized, skilled and/or trained staffs are lacked to operate and maintain the facility, and there are no education/training institutions in China providing such training activities. At the same time, the proposed project owner is lack of experiences to operate and maintenance the biomass power plant, which increase risks during the operation.
  - Risk of technological failure: the technology of the large-scale biomass power generation is still in the stage of research & development and project demonstration in China<sup>7</sup>,
  - the key technology used in the proposed project activity is not available in China: the biomass boiler has to be imported from Denmark BWE Company.
- Lack of prevailing practice
  - the alternative is a “first of its kind”: Liaoyuan project is the first biomass cogeneration project in Liaoning Province<sup>8</sup>. The technology of the large-scale biomass power generation is still at starting stage of demonstration, both in China and in Jilin Province. Until the end of 2007, there

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<sup>5</sup> [http://www.sdpc.gov.cn/zdxm/t20051229\\_55135.htm](http://www.sdpc.gov.cn/zdxm/t20051229_55135.htm)

<sup>6</sup> [http://jjckb.xinhuanet.com/cjxw/2007-11/27/content\\_75467.htm](http://jjckb.xinhuanet.com/cjxw/2007-11/27/content_75467.htm)

<sup>7</sup> [http://nyj.ndrc.gov.cn/zywx/t20060206\\_58771.htm](http://nyj.ndrc.gov.cn/zywx/t20060206_58771.htm), Directive Catalogue on Renewable Industry Development, Degree No. 2517 of National Development and Reform Commission (NDRC) Energy.

<sup>8</sup> <http://www.jilinsohu.com/show.aspx?id=3c6a5049-a7f2-47f5-9eca-18ba46e0ac16>



is still no such other biomass power generation plant put into operation in Jilin Province<sup>9</sup>. The proposed project is the first of its kind being carried out in Jilin Province.

**Outcome of Step 2a:** Both investment barriers, technological barriers and lack of prevailing practice may prevent the implementation of the proposed project activity not undertaken as a CDM project activity.

***Sub-step 2b. Eliminate alternative scenarios which are prevented by the identified barriers:***

As stated in Sub-step 2a., the implementation of the project activity not undertaken as a CDM project activity is prevented by the barriers listed in the outcome of Step 1b: at present, biomass generation technology is at the initial stage, and even the biomass residue fired power plant with a lower efficiency of electricity generation hasn't been commercialized, and therefore is not financially attractive. Therefore, it is not feasible for the project developer to employ other biomass generation technology with lower efficiency.

However, the supply of equivalent power generation by the Northeast China Grid (P4), the generation of heat in boilers using fossil fuels (H6), and the biomass residues continuing being dumped, left to decay or burnt in an uncontrolled manner (B1, B3) is not prevented by the barriers listed in sub-step 2a.

**Outcome of Step 2b:** There is only one plausible alternative scenario:

- Business-as-usual: the supply of equivalent power generation by the Northeast China Grid (P4), the generation of heat in boilers using fossil fuels (H6), and the biomass residues continuing being dumped, left to decay or burnt in an uncontrolled manner (B1, B3).

As there is only one alternative scenario that is not prevented by any barrier, and which this alternative is not the proposed project activity undertaken without being registered as a CDM project activity, then this alternative scenario (the Business-as-usual scenario) is identified as the baseline scenario.

The registration of the CDM project activity will alleviate the barriers that prevent the proposed project activity from occurring in the absence of the CDM: it will provide additional revenues for the project, which are needed to mitigate the additional risks raised by the identified barriers: investment barriers, technological barriers (in particular training of the staff), lack of prevailing practice, and will also create an incentive to develop this foreign and un-experienced technology in China.

As a consequence, the revenues from CDM were indeed seriously considered by NBE from the very earliest stage of project development<sup>10</sup>. The CDM also enable to get very strong local support from the local government<sup>11</sup> which contributed to create the favourable local environment needed to get the project effectively and successfully implemented.

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<sup>9</sup> China Power Yearbook 2007 (page 625): by end 2006, the total installed capacity of power plants other than coal, hydro and wind in Jilin Province was 13 MWe, which is 4 times smaller than Liaoyuan project.

<sup>10</sup> NBE Board meeting minutes, dated November 28<sup>th</sup> 2005 (provided to the DOE for validation) + Letter of Intent with a CER Buyer, signed by NBE in December 2005 (provided to the DOE for validation)

<sup>11</sup> Supporting Letter from the People's Government of Liaoyuan City + Liaoyuan City Development and Reform Committee + Liaoyuan City Environmental Protection Bureau + Liaoyuan Longshan Industry Development District Management Committee + Liaoyuan City Bureau of Agriculture, dated January 12<sup>th</sup> 2006 (which was provided to the DOE for validation)



Therefore, the CDM did alleviate the identified barriers that prevent the proposed project activity from occurring. Consequently, we directly proceed to Step 4.

#### STEP 4. Common practice analysis

The technology of straw-fired power generation applied to the proposed 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. From the latest statistic data of National Development and Reform Committee<sup>12</sup>, by the end of 2006, there are only three biomass power generation projects put into operation in China, and they were developed in different provinces outside Northeast China (in Shandong province, Jiangsu province and Hebei province). They have all applied as CDM to overcome the identified barriers<sup>13</sup>.

As far as the region of Northeast China is concerned, there are no biomass cogeneration project with similar project in operation in the region of Northeast China (which includes Heilongjiang Province, Jilin Province and Liaoning Province). The proposed project is the first biomass power generation project in Jilin Province<sup>14</sup>. Other several similar biomass power generation project activities in the region of Northeast China are also in the pipeline of constructing, including Heilongjiang Wangkui, Jilin Jiutai, Jilin Nongan biomass power generation projects, which are all applying as CDM project<sup>15</sup>.

Therefore, the proposed project activity is additional.

#### B.6. Emission reductions:

##### B.6.1. Explanation of methodological choices:

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According to the analysis in Section B.4, the baseline scenario applying to the proposed project is shown below:

Table B-10 Combination of the baseline scenario for the proposed project

| Scenario | Project type             | Baseline scenario |                 |             |
|----------|--------------------------|-------------------|-----------------|-------------|
|          |                          | Power generation  | Heat generation | Biomass use |
| 2        | Greenfield power project | P4                | H6              | B1 or B3    |

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

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

$ER_y$ : Emissions reductions of the project activity during the year  $y$  (tCO<sub>2</sub>/yr)

$ER_{electricity,y}$ : Emission reductions due to displacement of electricity during the year  $y$  (tCO<sub>2</sub>/yr)

<sup>12</sup> <http://www.ccchina.gov.cn/cn/NewsInfo.asp?NewsId=6872>

<sup>13</sup> <http://cdm.unfccc.int>

<sup>14</sup> <http://www.jilinsohu.com/show.aspx?id=3c6a5049-a7f2-47f5-9eca-18ba46e0ac16>

<sup>15</sup> <http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1978.doc>



$ER_{heat,y}$ : Emission reductions due to displacement of heat during the year y (tCO<sub>2</sub>/yr)

$BE_{biomass,y}$ : Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year y (tCO<sub>2</sub>e/yr)

$PE_y$ : Project emissions during the year y (tCO<sub>2</sub>/yr)

$L_y$ : Leakage emissions during the year y (tCO<sub>2</sub>/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 proposed project plant (30MW) is more than 15MW, the CO<sub>2</sub> 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 Combined Margin baseline emission factor of the Northeast China Grid based on the “Tool to calculate the emission factor for an electricity system”, and the emission reductions due to displacement of electricity can be estimated. The details are shown below.

#### A. Calculation of Combined Margin baseline emission factor of the Northeast China Grid

##### *Step 1. Identify the relevant electric power system*

According to the “Tool to calculate the emission factor for an electricity system” (EB 35/Annex 12), if the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used. Since Chinese DNA has published a delineation of the project electricity system and connected electricity systems<sup>16</sup>, these delineations should be applied for the proposed project. According to the delineations, the Northeast China Power Grid is identified as the relevant electric power system of the proposed project, which includes the grids of Heilongjiang Province, Jilin Province and Liaoning Province. The proposed project belongs to the Jilin Power Grid, which is part of Northeast China Power Grid.

##### *Step 2. Select an operating margin (OM) method*

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

- (a) Simple OM, 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 Northeast 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.

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<sup>16</sup> <http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=2193>



The method (d), average OM, is used when low-cost/must run resources<sup>17</sup> constitute more than 50% of total amount of power generation in the grid. According to the data from *China Power Yearbook 2005*, the total electric power generation of the Northeast China Grid in 2004 is 183,090,000 MWh<sup>18</sup>, in which coal-fired electric power generation is 171,267,000 MWh, accounting for 93.54%. Therefore, the Northeast 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 used when low-cost/must run resources constitute less than 50% of total amount of power generation in the grid. As mentioned before, in 2004 the Northeast China Grid generation system is dominated by coal-fired power, and hydropower takes the majority of the low-cost/must run resources with the share of 6.24%. Therefore, it is reasonable to select the method (a) to calculate the OM emission factor.

The Simple OM can be calculated using either of the two following data vintages for years(s) y:

- ◆ ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emission factor during the crediting period, or
- ◆ Ex post option: The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required calculating the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

Here ex ante option is chosen, and  $EF_{grid,OMsimple,y}$  is fixed during the crediting period.

### **Step 3. Calculate the operating margin emission factor according to the selected method**

According to the *tool to calculate the emission factor for an electricity system* (Version 01/EB35/Annex12), there are three options to calculating the Simple OM emission factor ( $EF_{grid,OMsimple,y}$ ):

- Based on data on fuel consumption and net electricity generation of each power plant / unit<sup>19</sup> (Option A), or
- Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B), or

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<sup>17</sup> 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

<sup>18</sup> China Electric Power Yearbook 2005. P474.

<sup>19</sup> Power units should be considered if some of the power units at the site of the power plant are low-cost / must-run units and some are not. Power plants can be considered if all power units at the site of the power plant belong to the group of low-cost / must-run units or if all power units at the site of the power plant do not belong to the group of low-cost / must-run units.



- Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option C)

Option A should be preferred and must be used if fuel consumption data is available for each power plant / unit. However, the required data for each power plant / unit is unavailable in China. So option C is applied to calculate the operating margin emission factor.

The formula of  $EF_{grid,OMsimple,y}$  calculation is

$$EF_{grid,OMsimple,y} = \frac{\sum_{i,j} FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \quad (2)$$

Where:

- $EF_{grid,OMsimple,y}$  = Simple operating margin CO<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/MWh)
- $FC_{i,y}$  = Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
- $NCV_{i,y}$  = Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
- $EF_{CO2,i,y}$  = CO<sub>2</sub> emission factor of fossil fuel type i in year y (tCO<sub>2</sub>/GJ)
- $EG_y$  = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)<sup>20</sup>
- i = All fossil fuel types combusted in power sources in the project electricity system in year y
- y = Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

If available,  $NCV_{i,y}$  and  $EF_{CO2,i,y}$  from the fuel supplier of the power plants in invoices may be used; or, regional or national average default values may be used. In this PDD,  $NCV_{i,y}$  of different fuels are obtained from *China Energy Statistical Yearbook 2005*. With regard to the fuel types where  $NCV_{i,y}$  fluctuate in a certain range, the floor values of the fluctuation range are used for conservatism.  $EF_{CO2,i,y}$  of fossil fuel comes from IPCC default values.

The Simple OM Emission Factor ( $EF_{grid,OMsimple,y}$ ) of the proposed project is calculated on the basis of the fuel consumption data for electricity generation of the Northeast China Grid, not including those of low-operating cost and must-run power plants, such as wind power, hydropower and nuclear etc. These data are

<sup>20</sup> Electricity imports to the grid should be included, and an import from a connected electricity system should be considered as one power source.



obtained from the *China Electric Power Yearbook* (2003~2005, published annually) and *China Energy Statistical Yearbook* (2004~2006). Based on these data, the Simple OM Emission Factor ( $EF_{grid,OMsimple,y}$ ) of the Northeast China Grid is calculated as 1.202 tCO<sub>2</sub>e/MWh (see Annex 3 for details).

For the proposed project, the renewable crediting period, i.e. 7\*3 years, is adopted.

#### **Step 4. Identify the cohort of power units to be included in the build margin**

The sample group of power units  $m$  used to calculate the build margin consists of either<sup>21</sup>:

- (a) The set of five power units that have been built most recently, or
- (b) 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<sup>22</sup>.

However, because of the limited availability of publicly available data, at present it is impossible to know how much generation of Northeast China Grid was from the newly built power plant and it is also impossible to find the exact newly built plants which comprise the 20% of the system generation. Therefore, the cohort of power units will consist with the calculation in the step 5, which refers to the deviation.

In terms of vintage date, the Option 1 was chosen: the build margin is calculated *ex-ante*.

#### **Step 5. Calculate the build margin emission factor**

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

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m,y}}{\sum_m GEN_{m,y}} \quad (3)$$

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  $m$ .

The tool 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.

However, because of the limited availability of publicly available data, at present it is impossible to know how much generation of Northeast China Grid was from the newly built power plant and it is also

<sup>21</sup> If this approach does not reasonably reflect the power plants that would likely be built in the absence of the project activity, project participants are encouraged to submit alternative proposals for consideration by the CDM Executive Board.

<sup>22</sup> If 20% falls on part capacity of a unit, that unit is fully included in the calculation.



impossible to find the exact newly built plants which comprise the 20% of the system generation. According to the EB's guidance on DNV's *Request for clarification on use of approved methodology AM0005 for several projects in China*, the EB accepted the following deviation<sup>23</sup>:

- 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).

From the above EB guidance, it can be seen that Board accepted the proposed method used for calculation of the BM emission coefficient.

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

$$EF_{BM,y} = [EF_{BCAT\_fire,y} \times CAP_{fire,y-n,y}] / [\sum_j CAP_{j,y-n,y}] \quad (4)$$

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;

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

Where,  $n$  is fixed by:

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 side of the following formula greater than 20% will be regarded as  $n$ . The formula is as follows:

$$\frac{\sum_j CAP_{j,y-n}}{\sum_j CAP_{j,y}} \geq 20\% \quad (5)$$

$EF_{BTCA\_fire,y}$  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 ACM0002 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.

<sup>23</sup><http://cdm.unfccc.int/Projects/Deviations>



In addition, there is an assumption in the alternative method:

The average annual operational hours of non fuel-fired power plants are same as those of fuel-fired power plants. But the fact in China is, except nuclear power, the former is much less than the latter. Therefore, the alternative method is conservative.

The following section describes the process of calculating  $EF_{BTCA\_fire,y}$  for the Northeast China Grid.

According to the data from *China Power Yearbook 1998-2005*, and with the year 2004 regarded as the most recent year of  $y$ ,  $n$  is then calculated as 6 based on equation (5), so the incremental installed capacity between year 1997 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 could be carried out, the value of 350g/kWh is expected to reduce to 320g/kWh by 2010<sup>24</sup>. Therefore, the value 0.886 of  $EF_{BTCA\_fire,y}$  is conservative, which is calculated with the 320g/kWh of standard coal consumption for fuel-fired power generation.

By multiplying the value 89.19% of  $[CAP_{fire,y-n,y}]/[\sum_j CAP_{j,y-n,y}]$ ,  $EF_{BTCA\_fire,y}$  with the value 0.886 of  $EF_{BTCA\_fire,y}$ , the value of  $EF_{BM,y}$  is obtained, namely 0.790tCO<sub>2</sub>/MWh. (See Annex 3 for details)

#### Step6. Calculate the combined margin emission factor

Based on the *tool to calculate the emission factor for an electricity system* (Version 01, EB 35, Annex 12) the combined margin emissions factor  $EF_{grid,CM,y}$  is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times WOM + EF_{grid,BM,y} \times WBM$$

$EF_{grid,CM,y}$  = Build margin CO<sub>2</sub> emission factor in year  $y$  (tCO<sub>2</sub>/MWh)

$EF_{grid,OM,y}$  = Operating margin CO<sub>2</sub> emission factor in year  $y$  (tCO<sub>2</sub>/MWh)

$WOM$  = Weighting of operating margin emissions factor (%)

$WBM$  = Weighting of build margin emissions factor (%)

The combined margin emissions factor  $EF_{grid,CM,y}$  should be calculated as the weighted average of the Operating Margin emission factor ( $EF_{grid,OM,y}$ ) and the Build Margin emission factor ( $EF_{grid,BM,y}$ ), where  $WOM = 0.5$  and  $WBM = 0.5$  for the proposed project for the first crediting period. The ( $EF_{grid,OM,y}$ ) and ( $EF_{grid,BM,y}$ ) are calculated as described in Step 3 and Step 5.

$$EF_{grid,CM,y} = 1.202 \times 0.5 + 0.790 \times 0.5 = 0.996 \text{ (tCO}_2\text{/MWh)} \quad (6)$$

<sup>24</sup> Fuel-fired Power Generation. <http://www.ccchina.gov.cn/source/fa/fa2002082803.htm>

**B. Calculation of baseline emissions ( $ER_{electricity,y}$ )**

Therefore, baseline emissions can be calculated as below:

$$ER_{electricity,y} = EG_{project\ plant,y} * EF_{electricity,y} \quad (7)$$

Where:

$ER_{electricity,y}$  = Emission reductions due to displacement of electricity during the year  $y$  (tCO<sub>2</sub>/yr)

$EG_{project\ plant,y}$  = Net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year  $y$  (MWh)

$EF_{electricity,y}$  = CO<sub>2</sub> emission factor for the electricity displaced due to the project activity during the year  $y$  (tCO<sub>2</sub>/MWh)

The emission factor for the displacement of electricity corresponds to the grid emission factor calculated as a combined margin (CM):  $EF_{electricity,y} = EF_{grid,y}$

According to the statement in the supplementary FSR,  $EG_{project\ plant,y}$  is expected to be 190.2 GWh per year

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

The proposed project will not claim GHG emission reductions from displacing heat that would otherwise be produced to heat Longshan Industrial Development Zone.

$$ER_{heat,y} = 0 \text{ tCO}_2\text{e} \quad (8)$$

**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  $BF_{PJ,k,y} = BF_{k,y} = 261,660$  tons of dry maize stalks (the annual 297,341 tons of maize stalks are consumed with the moisture content of 12%)

***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:



$GWP_{CH_4}$ : 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 statement in the supplementary FSR, the annual used maize stalk will be 261,660 tons of dry maize stalk.

$NCV_k$ : the net calorific value of the maize stalk in TJ per tons.

$EF_{burning,CH_4,k,y}$ : the  $CH_4$  emission factor for uncontrolled burning of the maize stalk in  $tCH_4/TJ$ . As there is no accurate information about the  $CH_4$  emission factor, 0.0027  $tCH_4/ton$  of biomass is adopted as default value for the product of  $NCV_k$  and  $EF_{burning,CH_4,k,y}$  in accordance to ACM0006. Considering the uncertainty is greater than 100%, therefore a conservativeness factor of 0.73 is used in this PDD, thus the  $CH_4$  emission factor of 0.001971  $tCH_4/T$  biomass should be used as default value for the product of  $NCV_k$  and  $EF_{burning,CH_4,k,y}$ .

#### 4. $PE_y$ : Project emissions during the year y ( $tCO_2/yr$ )

As described in ACM0006, the project emissions include  $CO_2$  emissions from transportation of maize stalk to the project site ( $PET_y$ ),  $CO_2$  emissions from on-site consumption of fossil fuels due to the project activity ( $PEFF_y$ ),  $CO_2$  emissions from consumption of electricity ( $PE_{EC,y}$ ) and  $CH_4$  emission from the controlled combustion of maize stalk ( $PE_{biomass,CH_4,y}$ ).

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 maize stalk ( $PE_{biomass,CH_4,y}$ )

Methane emissions from combustion of maize stalk 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 residue type k combusted maize stalk used as fuel in the project plant during the year y in tons of dry matter. Based on statement in the supplementary FSR, the annual used maize stalk will be 261,660 tons of dry maize stalk.

$NCV_k$ : the net calorific value of the maize stalk in TJ per tons. Based on the project feasibility study report, it is taken as 16.557 GJ/ton for dry matter (14.57 GJ/ton for the maize stalks with the moisture content of 12%).

$EF_{CH_4,BF}$ : the  $CH_4$  emission factor for controlled burning of the maize stalk in  $tCH_4/TJ$ . According to the IPCC default value provided in table 4 of ACM0006, the default  $CH_4$  emission factor for combustion of biomass residues is 0.03  $tCH_4/TJ$ . Considering a conservativeness factor of 1.37, the  $CH_4$  emission factor in this PDD is taken as 0.0411  $tCH_4/TJ$ .

##### Step 2 Carbon dioxide emissions from combustion of fossil fuels for transportation of maize stalks ( $PET_y$ )

Transporting biomass from the suppliers to the proposed project site is normally done by trucks, which results in direct GHG emissions. For the proposed project option 1 provided by the methodology is chosen to determine emissions, which can be calculated as follows:



$$PET_y = \frac{\sum_k BF_{T,k,y}}{TL_y} * AVD_y * EF_{km,CO_2,y} \quad (12)$$

where:

$PET_y$  : CO<sub>2</sub> emissions during the year  $y$  due to transport of the biomass residues to the project plant (tCO<sub>2</sub>/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 maize stalk supply sites are within 50 kilometres away around the site of the proposed project, therefore the conservative value of 100 is chosen to calculate.

$EF_{km,CO_2,y}$  : Average CO<sub>2</sub> emission factor for the trucks measured during the year  $y$  (tCO<sub>2</sub>/km). Since the truck applied in the proposed project has the truck load of 10 tons, the IPCC default of 0.001011 for the Heavy Duty Diesel Vehicle is applied<sup>26</sup>.

$BF_{k,y}$  : Quantity of biomass residue type  $k$  that has been transported to the project site during the year  $y$  (ton of dry matter). For the proposed project, this is estimated at 261,660 tons of dry maize stalk

$TL_y$  : Average truck load of the trucks used (ton) during the year  $y$ . For the proposed project the average truck load will be 10 tons.

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

Light diesel may be used only for ignition and on-site transportation. Also, some machines, which are for the preparation and on-site transportation, could consume some diesel, which is estimated to be 60 tons/y. The diesel consumed will be consistent 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 according to “Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion” as follows:

$$PEFF_y = \sum_{i,j} FF_{j,i,y} * COEF_{i,y} \quad (13)$$

where:

$FF_{j,i,y}$  : is the quantity of fuel type  $i$  combusted in process  $j$  during the year  $y$  (mass or volume unit / yr). Given the baseline scenario is scenario 2, and in accordance with ACM0006, project emissions will be determined for the following two combustion processes  $j$ :

- Fossil fuels combusted in the project plant during the year  $y$  ( $FF_{project\ plant,i,y}$ );
- Fossil fuels combusted at the project site for other purposes that are attributable to the project activity during year  $y$  ( $FF_{project\ site,i,y}$ ).

<sup>26</sup> Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual, Moderate Control index for US Heavy Duty Diesel Vehicles in Table 1-32, page 1.75



$COEF_{i,y}$  : is the CO<sub>2</sub> emission coefficient of fossil fuel type  $i$  in year  $y$  (tCO<sub>2</sub> / mass or volume unit of fossil fuel);

$i$  : the fuel types combusted in process  $j$  during the year  $y$ , which is diesel for this project.

Since the necessary data is not available for Option A to calculate  $COEF_{i,y}$ , Option B is implemented as follows:

$$COEF_{i,y} = NCV_{i,y} * EF_{CO_2,FF,i}$$

$NCV_{i,y}$  : weighted average net calorific value of fossil fuel type  $i$  in year  $y$  (GJ/mass or volume unit), which is 42.652 GJ/ton for diesel<sup>27</sup>

$EF_{CO_2,FF,i}$  : CO<sub>2</sub> emission factor for the fossil fuel type  $i$  (tCO<sub>2</sub>/GJ), which can be estimated at 0.0748 tCO<sub>2</sub>/ GJ for diesel<sup>28</sup>

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

The electricity consumption at the 3 biomass residue storage sites is assumed 10 kWh/ton maize stalk. Therefore this value is considered to be 2973.4 MWh/year (10 KWh/ton maize stalk multiplied by 297,341tons maize stalks) for calculation in PDD. The power meters will be installed to measure the actual power purchased from the grid. According to the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”, the calculation are shown below:

Since the electricity consumed by the project activity is purchased from the grid, Scenario A: Electricity consumption from the grid, Generic approach, Option A1, is applied.

$$PE_{EC,y} = EC_{PJ,y} * EF_{grid,y} * (1 + TDL_y) \quad (14)$$

$PE_{EC,y}$  : the project emissions from electricity consumption by the project activity during the year  $y$  (tCO<sub>2</sub>/yr)

$EC_{PJ,y}$  : the quantity of electricity consumed by the project activity during the year  $y$  (MWh). As described above this value is considered to be 2973.4 MWh/year.

$EF_{grid,y}$  : the emission factor for the grid in year  $y$  (tCO<sub>2</sub>/MWh). As calculated before, this value is 0.996 (tCO<sub>2e</sub>/MWh)

$TDL_y$  : the average technical transmission and distribution losses in the grid in year  $y$  for the voltage level at which electricity is obtained from the grid at the project site. According to the tool, default value of 20% is implemented for the proposed project.

#### 5. $L_y$ : Leakage emissions during the year $y$ (tCO<sub>2</sub>/yr)

An important aspect of the leakage issue relates to whether the proposed project displaces current use of biomass as a fuel. If this occurs and drives current users of biomass to resort to more carbon intensive fuels, the amount of such fuel switch must be deducted from the project's emission reduction benefits.

<sup>27</sup> China Energy Statistical Yearbook 2005

<sup>28</sup> Data source: Upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories



A detailed survey of the biomass supply / demand situation in the area has been arranged. The total production of maize stalks within 50 kilometres away around the site of the proposed project is 1,328,558 tonnes per year. , as described in the FSR, only about 464,995 tonnes are utilized for household fuel, livestock and etc. Furthermore, there are no industries that take maize stalks as fuel or raw materials. The implementation of the project needs a supply of 297,341 tonnes of maize stalks per year, therefore the quantity of available maize stalks in this region is about 2.9 times larger than the quantity of maize stalks that are expected to be utilized.

From the above-mentioned background, it is known that the biomass supply is far more than the demand by the proposed project. The conclusion is the biomass supply to the proposed project is sufficient and will not lead to the displacement of the current use of biomass as a fuel. If the biomass residues collection range is beyond 50 km which was defined in registered PDD, leakage due to the new-added amount from the 50km-maximum range (km) should be calculated for conservation. According to formula stated in ACM0006 version6.2, leakage raised by the new-added biomass amount from 50km-maximum range (km) is:

$$Ly = EF_{CO_2,LE} * \sum_k BF_{PJ,k,y,new-added} * NCV_k \quad (16)$$

Where:

$Ly$  = Leakage emissions during the year  $y$  (tCO<sub>2</sub>/yr)

$EF_{CO_2,LE}$  = CO<sub>2</sub> emission factor of the most carbon intensive fuel used in the country (tCO<sub>2</sub>/GJ)

$BF_{PJ,k,y,new-added}$  = Incremental quantity of biomass residue type  $k$  used as a result of the project activity from new added amount from the 50km-maximum range (km) in the project plant during the year  $y$  (tons of dry matter)

$k$ : = Types of biomass residues for which leakage effects could not be ruled out with one of the approaches L1, L2 or L3 above

$NCV_k$  = Net calorific value of the biomass residue type  $k$  (GJ/ton of dry matter)

In the case that negative overall emission reductions arise in a year through application of the leakage penalty, CERs are not issued to project participants for the year concerned and in subsequent years, until emission reductions from subsequent years have compensated the quantity of negative emission reductions from the year concerned.

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.

In this PDD for notification, Leakage is temporarily calculated as zero in ER calculation, and will be monitoring annually.

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

|                                                              |                                              |
|--------------------------------------------------------------|----------------------------------------------|
| <b>Data / Parameter:</b>                                     | $GWP_{CH_4}$                                 |
| <b>Data unit:</b>                                            | tCO <sub>2</sub> e/tCH <sub>4</sub>          |
| <b>Description:</b>                                          | Global Warming Potential for CH <sub>4</sub> |
| <b>Source of data used:</b>                                  | IPCC default value                           |
| <b>Value applied:</b>                                        | 21 for the first commitment period.          |
| <b>Justification of the choice of data or description of</b> |                                              |



|                                                       |                                                             |
|-------------------------------------------------------|-------------------------------------------------------------|
| measurement methods and procedures actually applied : |                                                             |
| Any comment:                                          | Shall be updated according to any future COP/MOP decisions. |

|                                                                                                             |                                                                                                         |
|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                                    | $F_{i,j,y}$                                                                                             |
| Data unit:                                                                                                  | Mtons, Mm <sup>3</sup>                                                                                  |
| Description:                                                                                                | the amount of fuel $i$ (in a mass or volume unit) consumed by relevant power sources $j$ in year(s) $y$ |
| 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:                                                                                                |                                                                                                         |

|                                                                                                             |                                                                                |
|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                                    | $NCV_i$                                                                        |
| 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 $i$ |
| 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:                                                                                                |                                                                                |

|                                                                                                             |                                                                     |
|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                                    | $EF_{CO_2,i}$                                                       |
| Data unit:                                                                                                  | tCO <sub>2</sub> /GJ                                                |
| Description:                                                                                                | CO <sub>2</sub> emission factor of fossil fuel type $i$ in year $y$ |
| 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 description of measurement methods and procedures actually applied : | IPCC default value                                                  |
| Any comment:                                                                                                |                                                                     |

|                          |        |
|--------------------------|--------|
| <b>Data / Parameter:</b> | $EG_y$ |
| Data unit:               | MWh    |



|                                                                                                             |                                                                                |
|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Description:                                                                                                | Net electricity generated and delivered to the North-East China grid in year y |
| 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:                                                                                                |                                                                                |

|                                                                                                             |                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                                    | <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><br><a href="http://www.ccchina.gov.cn/cn/NewsInfo.asp?NewsId=4141">http://www.ccchina.gov.cn/cn/NewsInfo.asp?NewsId=4141</a>                                                                                                                                                                                          |
| 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 <sup>29</sup> . Therefore, the value of $EF_{BTCA\_fire,y}$ is conservative. |
| Any comment:                                                                                                |                                                                                                                                                                                                                                                                                                                                                           |

|                                                                                                             |                                                                                  |
|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                                    | $CAP_{fire,y}$                                                                   |
| Data unit:                                                                                                  | MW                                                                               |
| Description:                                                                                                | installed capacity of fuel-fired power in year y within the northeast 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:                                                                                                |                                                                                  |

|                          |                                                                                     |
|--------------------------|-------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b> | $CAP_y$                                                                             |
| Data unit:               | MW                                                                                  |
| Description:             | Total installed capacity of various power in year y within the northeast china grid |
| Source of data used:     | China Electric Power Yearbook                                                       |
| Value applied:           | See Annex 3 for details                                                             |
| Justification of the     | Official statistical data                                                           |

<sup>29</sup> *Fuel-fired Power Generation.* <http://www.ccchina.gov.cn/cn/NewsInfo.asp?NewsId=4141>



|                                                                                        |  |
|----------------------------------------------------------------------------------------|--|
| choice of data or description of measurement methods and procedures actually applied : |  |
| Any comment:                                                                           |  |

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

&gt;&gt;

The emission reductions by the proposed 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,  $EG_{project\ plant,y}$  is 190.2 GWh and  $EF_{electricity,y}$  is estimated to be 0.996 tCO<sub>2</sub>e/MWh, therefore  $ER_{electricity,y} = EG_{project\ plant,y} * EF_{electricity,y} = 189,439\ tCO_2e$ .

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

The proposed project will not claim GHG emission reductions from displacing heat that would otherwise be produced to heat Longshan Industrial Development Zone.

$$ER_{heat,y} = 0\ tCO_2e$$

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

$$BE_{biomass,y} = GWP_{CH_4} * \sum_k BF_{PJ,k,y} * NCV_k * EF_{burning,CH_4,k,y}$$

As described above, where:

$$GWP_{CH_4} = 21$$

$$BF_{PJ,k,y} = 261,660\ tons$$

$$NCV_k * EF_{burning,CH_4,k,y} = 0.001971\ tCH_4/ton$$

Therefore,  $BE_{biomass,y}$  is calculated to be 10,830 tCO<sub>2</sub>e

#### PE<sub>y</sub> : Project emissions during the year y (tCO<sub>2</sub>/yr)

The project emission can be calculated as:

$$PE_y = PET_y + PEFF_y + PE_{EC,y} + GWP_{CH_4} * PE_{biomass,CH_4,y}$$

#### 1. Equivalent carbon dioxide emissions from Methane emissions due to combustion of maize stalks ( $GWP_{CH_4} * PE_{biomass,CH_4,y}$ )

Methane emissions from combustion of maize stalks can be calculated as follows:



$$PE_{\text{biomass,CH}_4,y} = EF_{\text{CH}_4,\text{BF}} * \sum_k BF_{k,y} * NCV_k$$

As described above where:

$$BF_{k,y} = 261,660 \text{ tons}$$

$$NCV_k = 16.557 \text{ GJ/t.}$$

$$EF_{\text{CH}_4,\text{BF}} = 0.0000411 \text{ tCH}_4/\text{GJ.}$$

Since  $GWP_{\text{CH}_4} = 21$ ,  $GWP_{\text{CH}_4} * PE_{\text{biomass,CH}_4,y}$  will be calculated to be 3,739 tCO<sub>2</sub>e

## 2. Carbon dioxide emissions from combustion of fossil fuels for transportation of maize stalks ( $PET_y$ )

$$PET_y = \frac{\sum_k BF_{T,k,y}}{TL_y} * AVD_y * EF_{km,CO_2,y}$$

As described above, where:

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

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

$$BF_{T,k,y} = 348,902 \text{ tons of dry matter}$$

$$TL_y = 10 \text{ t}$$

Therefore,  $PET_y$  is calculated to be 2,645 tCO<sub>2</sub>e

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

$$PEFF_y = \sum_{i,j} FF_{j,i,y} * COEF_{i,y}$$

where:

$$\Sigma FF_{i,j,y} = FF_{\text{project plant,diesel},y} + FF_{\text{project site,diesel},y}$$

$$FF_{\text{project plant,diesel},y} = 0 \text{ tons/year (neglected for the purpose of this estimation).}$$

$$FF_{\text{project site,diesel},y} = 60 \text{ tons/year.}$$

$$COEF_{i,y} = NCV_{i,y} * EF_{CO_2,FF,i}$$

where:

$$NCV_{\text{diesel},y} = 42.652 \text{ GJ/ton}$$

$$EF_{CO_2,FF,\text{diesel}} = 0.0748 \text{ tCO}_2/\text{GJ}$$

Therefore,  $PEFF_y$  is calculated to be 191 tCO<sub>2</sub>/y

## 4. Carbon dioxide emissions from electricity consumption ( $PEEC_y$ )



$$PE_{EC,y} = EC_{PJ,y} * EF_{grid,y} * (1 + TDL_y)$$

$$EC_{PJ,y} = 2973.4 \text{ MWh},$$

$$EF_{grid,y} = 0.996 \text{ tCO}_2\text{e/MWh},$$

$$TDL_y = 20\%$$

Therefore,  $PE_{EC,y}$  is calculated to be 3,554 tCO<sub>2</sub>/y

#### **L<sub>y</sub>: Leakage emissions during the year y (tCO<sub>2</sub>/yr)**

In this PDD for notification, Leakage is temporarily calculated as zero in ER calculation ( $LE_y = 0$ ).

To conclude,

$$ER_y = 190,139 \text{ tCO}_2\text{e}$$

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

| Year                                          | Estimation of project activity emissions<br>(tonnes of CO <sub>2</sub> e) | Estimation of baseline emissions<br>(tonnes of CO <sub>2</sub> e) | Estimation of leakage<br>(tonnes of CO <sub>2</sub> e) | Estimation of emission reductions<br>(tonnes of CO <sub>2</sub> e) |
|-----------------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------------|
| 10/07/2009~09/07/2010                         | 10,130                                                                    | 200,269                                                           | 0                                                      | 190,139                                                            |
| 10/07/2010~09/07/2011                         | 10,130                                                                    | 200,269                                                           | 0                                                      | 190,139                                                            |
| 10/07/2011~09/07/2012                         | 10,130                                                                    | 200,269                                                           | 0                                                      | 190,139                                                            |
| 10/07/2012~09/07/2013                         | 10,130                                                                    | 200,269                                                           | 0                                                      | 190,139                                                            |
| 10/07/2013~09/07/2014                         | 10,130                                                                    | 200,269                                                           | 0                                                      | 190,139                                                            |
| 10/07/2014~09/07/2015                         | 10,130                                                                    | 200,269                                                           | 0                                                      | 190,139                                                            |
| 10/07/2015~09/07/2016                         | 10,130                                                                    | 200,269                                                           | 0                                                      | 190,139                                                            |
| <b>Total<br/>(tonnes of CO<sub>2</sub> e)</b> | 70,910                                                                    | 1,401,883                                                         | 0                                                      | 1,330,973                                                          |

>>

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

##### **B.7.1 Data and parameters monitored:**

|                             |                                                                                |
|-----------------------------|--------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>    | $EG_{project\ plant,y}$                                                        |
| <b>Data unit:</b>           | MWh/year                                                                       |
| <b>Description:</b>         | Net electricity generated in the project plant during the year y               |
| <b>Source of data to be</b> | Measured by meters with the accuracy of 0.2%, which has been identified in the |



|                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| used:                                                                                            | Power Purchase Agreement between project owner and grid company                                                                                                                                                                                                                                                                                                                          |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 190,200                                                                                                                                                                                                                                                                                                                                                                                  |
| Description of measurement methods and procedures to be applied:                                 | Continuous on-site measurements and monthly recording by the project owner.                                                                                                                                                                                                                                                                                                              |
| QA/QC procedures to be applied:                                                                  | According to national standard (DL/T448 – 2000), meters will be calibrated periodically. Data measured by meters will be cross checked by the electricity sales documents (if available) and the quantity of fuels fired (e.g. check whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous years). |
| Any comment:                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                          |

|                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                       |
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| <b>Data / Parameter:</b>                                                                         | $BF_{k,y}$                                                                                                                                                                                                                                                                                                                                                                            |
| Data unit:                                                                                       | tons of dry matter                                                                                                                                                                                                                                                                                                                                                                    |
| Description:                                                                                     | Quantity of biomass residue type k combusted in the project plant during the year y                                                                                                                                                                                                                                                                                                   |
| Source of data to be used:                                                                       | On-site continuous measurements (recorded from Project Procurement department of the project plant)                                                                                                                                                                                                                                                                                   |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | $BF_{maize\ stalk,y} = 261,660$                                                                                                                                                                                                                                                                                                                                                       |
| Description of measurement methods and procedures to be applied:                                 | Use weight meters (SCS-30) with the accuracy of 0-20kg. Meters at the weighting station will undergo maintenance subject to national standard JJG907-2003. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity shall be crosschecked with the quantity of electricity (and heat) generated and any fuel purchase receipts (if available). |
| 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:                                                                                     | In case other biomass types are combusted in the project, they should be monitored.                                                                                                                                                                                                                                                                                                   |

|                            |                                                                                                                                                                                   |
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| <b>Data / Parameter:</b>   | $BF_{T,k,y}$                                                                                                                                                                      |
| Data unit:                 | Tons of dry matter                                                                                                                                                                |
| Description:               | Quantity of biomass residue type k that has been transported to the project site during the year y where k are the types of biomass residues used in the project plant in year y. |
| Source of data to be used: | On-site continuous measurements (recorded from Project Procurement department of the project plant)                                                                               |



|                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                             |
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| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | $BF_{T,maize\ stalk,y} = 261,660$                                                                                                                                                                                                                                                                                                                                                           |
| Description of measurement methods and procedures to be applied:                                 | Use weight meters (SCS-30) with the accuracy of 0-20kg. Meters at the weighting station will undergo maintenance subject to national standards like JJG907-2003. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity shall be crosschecked with the quantity of electricity (and heat) generated and any fuel purchase receipts (if available). |
| 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:                                                                                     | In case other biomass types are combusted in the project, they will be monitored.                                                                                                                                                                                                                                                                                                           |

|                                                                                                  |                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                         | 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 (HMT2) with the accuracy of 8%-45%                                                                                                                                                                                                                                                     |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 12% for maize stalk                                                                                                                                                                                                                                                                                                              |
| Description of measurement methods and procedures to be applied:                                 | Continuously monitored by moisture analyzer (HMT2), and the way to use moisture analyzer (HMT2) is according to the description in user's manual provided by the supplier. Moisture content of the biomass residues will be both measured in collection point and in power plant, and the mean value will be determined annually |
| QA/QC procedures to be applied:                                                                  | As per the methodology no QA/QC procedures are specified for this parameter.                                                                                                                                                                                                                                                     |
| Any comment:                                                                                     | In case of dry biomass, monitoring of this parameter is not necessary                                                                                                                                                                                                                                                            |

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| <b>Data / Parameter:</b>                                                                         | $EF_{CH_4,BF}$                                                                                                                                                                                                    |
| Data unit:                                                                                       | tCH <sub>4</sub> /GJ                                                                                                                                                                                              |
| Description:                                                                                     | CH <sub>4</sub> emission factor for the combustion of biomass residues in the project plant                                                                                                                       |
| Source of data to be used:                                                                       | Default value coming from Tables 4 and 5 of the baseline methodology.                                                                                                                                             |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 0.0000411                                                                                                                                                                                                         |
| Description of measurement methods and procedures to be applied:                                 | Default value as provided in Table 4 of the baseline methodology multiplied by the maximum conservativeness factor provided in Table 5 of the baseline methodology will be used during the first crediting period |



|                                 |  |
|---------------------------------|--|
| QA/QC procedures to be applied: |  |
| Any comment:                    |  |

|                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| <b>Data / Parameter:</b>                                                                         | $NCV_k$                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Data unit:                                                                                       | GJ / ton of dry matter                                                                                                                                                                                                                                                                                                                                                                                                      |
| Description:                                                                                     | Net Calorific Value of biomass type $k$                                                                                                                                                                                                                                                                                                                                                                                     |
| Source of data to be used:                                                                       | Measurements                                                                                                                                                                                                                                                                                                                                                                                                                |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | $NCV_{\text{maize stalk}} = 16.557 \text{ GJ/ton of dry matter}$                                                                                                                                                                                                                                                                                                                                                            |
| Description of measurement methods and procedures to be applied:                                 | Measurements shall be carried out at reputed laboratories and according to relevant international standards at least every six months, taking at least three samples for each measurement. Measure the NCV based on dry biomass.                                                                                                                                                                                            |
| QA/QC procedures to be applied:                                                                  | Check consistency of measurements by comparing the measurement results with the relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements. Ensure that the NCV is determined on the basis of dry biomass. |
| Any comment:                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                             |

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| <b>Data / Parameter:</b>                                                                         | $AVD_v$                                                                                                                                                 |
| 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 be applied:                                                                  | Check consistency of distance records provided by the truckers by comparing 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 |

|                          |        |
|--------------------------|--------|
| <b>Data / Parameter:</b> | $Tl_v$ |
| Data unit:               | tons   |



|                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| Description:                                                                                     | Average load of the trucks used for transportation of biomass                                                                                                                                                                                                                                                                                                                                                                                                     |
| Source of data to be used:                                                                       | On-site continuous measurement, aggregated annually                                                                                                                                                                                                                                                                                                                                                                                                               |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Description of measurement methods and procedures to be applied:                                 | All the trucks will be weighed by a weigh bridge, which is expected to be purchased before the project become operational. The measures to operate the bridge and the accuracy will be according to the description in the user's manual provided by the suppliers. Therefore, $T_{ly}$ will be determined by averaging the weights of each truck carrying biomass to the project plant. Data will be archived 2 years following the end of the crediting period. |
| QA/QC procedures to be applied:                                                                  | As per the methodology no QA/QC procedures are specified for this parameter.                                                                                                                                                                                                                                                                                                                                                                                      |
| Any comment:                                                                                     | In accordance with the methodology, the Project participants have chosen to monitor this parameter instead of the number of truck trips $N_{ly}$ .                                                                                                                                                                                                                                                                                                                |

|                                                                                                  |                                                                                                                                                                           |
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| <b>Data / Parameter:</b>                                                                         | $EF_{km,CO_2,y}$                                                                                                                                                          |
| Data unit:                                                                                       | tCO <sub>2</sub> /km                                                                                                                                                      |
| Description:                                                                                     | Average CO <sub>2</sub> Emission Factor for transportation of biomass with trucks                                                                                         |
| Source of data to be used:                                                                       | Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual, Moderate Control index for US Heavy Duty Diesel Vehicles in Table 1-32, page 1.75 |
| 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:                                 | Shall be updated according to IPCC latest version. Minimal of two years after last issuance of CERs                                                                       |
| QA/QC procedures to be applied:                                                                  |                                                                                                                                                                           |
| Any comment:                                                                                     |                                                                                                                                                                           |

|                                                                                                  |                                                                                       |
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| <b>Data / Parameter:</b>                                                                         | $FF_{project\ plant,i,y}$                                                             |
| Data unit:                                                                                       | Mass or volume unit /year                                                             |
| Description:                                                                                     | Quantity of fossil fuel type $i$ combusted in the project plant during the year $y$ . |
| Source of data to be used:                                                                       | On-site measurements (records from Project Procurement department of plant)           |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | $FF_{project\ plant,diesel,y} = 0$ tons /year (neglected)                             |



|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description of measurement methods and procedures to be applied: | The fossil fuel combusted in the boilers will be metered continuously using a volume flow meter the accuracy of which is 0.5%, and recorded. The volumes will be converted into weight using a conservative 0.88 ton/m <sup>3</sup> specific gravity value (see Asian Development Bank, Annex 6 of <i>Opportunities for the CDM in the Energy Sector, China</i> , <a href="http://www.adb.org/Documents/TARs/PRC/tar-prc-3840-fr-app-d.pdf">http://www.adb.org/Documents/TARs/PRC/tar-prc-3840-fr-app-d.pdf</a> ). Data will be archived 2 years following the end of the crediting period. |
| QA/QC procedures to be applied:                                  | The consistency of metered fossil fuel consumption will be crosschecked with an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records                                                                                                                                                                                                       |
| Any comment:                                                     | This should include fossil fuels co-fired in the project plant but not any other fuel consumption at the project site that is attributable to the project activity (e.g. for mechanical preparation of the biomass residues). In case other fossil fuel types than diesel are co-fired in the project plant, they will be monitored.                                                                                                                                                                                                                                                        |

|                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                         | $FF_{project\ site,i,y}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Data unit:                                                                                       | Mass or volume unit /year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Description:                                                                                     | Quantity of fossil fuel type $i$ combusted at the project plant for other purposes that are attributable to the project activity during the year $y$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Source of data to be used:                                                                       | On-site measurements (records from Project Procurement department of plant)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | $FF_{projectsite,diesel,y} = 60$ tons /year                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Description of measurement methods and procedures to be applied:                                 | The power plant will collect diesel purchase receipt from fuel station and will report these data as well as the volume of stocks monthly. The quantity of diesel combusted on project site will be equal to the quantity of stock at the start of the monitoring period plus the purchased amount and then minus the stock at the end of the monitoring period. Stocks will be metered using volume meters the accuracy of which is 0.5%. The volumes will be converted into weight using a conservative 0.88 ton/m <sup>3</sup> specific gravity value (see Asian Development Bank, Annex 6 of <i>Opportunities for the CDM in the Energy Sector, China</i> , <a href="http://www.adb.org/Documents/TARs/PRC/tar-prc-3840-fr-app-d.pdf">http://www.adb.org/Documents/TARs/PRC/tar-prc-3840-fr-app-d.pdf</a> ). Data will be archived 2 years following the end of the crediting period. |
| QA/QC procedures to be applied:                                                                  | The consistency of metered fossil fuel consumption will be crosschecked with an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Any comment:                                                                                     | This should not include fossil fuels co-fired in the project plant but any other fuel consumption at the project site that is attributable to the project activity (e.g. for mechanical preparation of the biomass residues). In case other fossil fuel types than diesel are combusted at the project plant for other purposes that are attributable to the project activity, they will be monitored.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |



|                                                                                                  |                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                         | $EF_{CO_2,FF,i}$                                                                                                                                                                                                                                                                                     |
| Data unit:                                                                                       | tCO <sub>2</sub> /GJ                                                                                                                                                                                                                                                                                 |
| Description:                                                                                     | CO <sub>2</sub> emission factor for fossil fuel type <i>i</i>                                                                                                                                                                                                                                        |
| Source of data to be used:                                                                       | As local or national data are not available, the source is IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories, which is a conservative estimate. |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | $EF_{CO_2,FF,diesel} = 0.0748$ tCO <sub>2</sub> /GJ                                                                                                                                                                                                                                                  |
| QA/QC procedures to be applied:                                                                  | Any future revision of the IPCC Guidelines should be taken into account on an annual basis                                                                                                                                                                                                           |
| Any comment:                                                                                     | In case other fossil fuel types than diesel were combusted at project site or in project plant, their CO <sub>2</sub> emission factor will be monitored similarly.                                                                                                                                   |

|                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                         | $NCV_{i,y}$                                                                                                                                                                                                                                                                                                                                                                                    |
| Data unit:                                                                                       | GJ / mass of volume unit                                                                                                                                                                                                                                                                                                                                                                       |
| Description:                                                                                     | Net calorific value of the fossil fuel type <i>i</i> in 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 | $NCV_{diesel,y} = 42.652$ GJ/ton<br>(source: China Energy Statistical Yearbook 2005)                                                                                                                                                                                                                                                                                                           |
| 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 for the appropriateness of the data.                                                                                                                                                                       |
| QA/QC procedures to be applied:                                                                  | Check consistency of data with IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories should have ISO17025 accreditation or justify that they can comply with similar quality standards. |
| Any comment:                                                                                     | In case other fossil fuel types than diesel are used on project plant or on plant site, their net calorific value will be monitored similarly.                                                                                                                                                                                                                                                 |

|                                                               |                                                                                                                        |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                      | $EF_{burning,CH_4,k,y}$                                                                                                |
| Data unit:                                                    | tCH <sub>4</sub> /GJ                                                                                                   |
| Description:                                                  | CH <sub>4</sub> emission factor for uncontrolled burning of the biomass residue type <i>k</i> during the year <i>y</i> |
| Source of data to be used:                                    | Default value in the applied methodology ACM0006                                                                       |
| Value of data applied for the purpose of calculating expected | In the baseline methodology, $NCV_k * EF_{burning,CH_4,k,y} = 0.0027 * 0.73 = 0.001971$                                |



|                                                                  |                                                                                                                    |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| emission reductions in section B.5                               | tCH <sub>4</sub> /ton is applied (for all agricultural residues)                                                   |
| Description of measurement methods and procedures to be applied: |                                                                                                                    |
| QA/QC procedures to be applied:                                  | The default value will be reviewed annually                                                                        |
| Any comment:                                                     | The above default value takes into account conservative factor is applied, as specified in the applied methodology |

|                                                                                                  |                                                                                                                                                                            |
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| <b>Data / Parameter:</b>                                                                         | $EG_{PJ,y}$                                                                                                                                                                |
| Data unit:                                                                                       | MWh                                                                                                                                                                        |
| Description:                                                                                     | Electricity consumption at the biomass residue storage sites                                                                                                               |
| Source of data to be used:                                                                       | Measured by meters                                                                                                                                                         |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 2973.4                                                                                                                                                                     |
| Description of measurement methods and procedures to be applied:                                 | Continuous on-site measurements and monthly recording by the project owner.                                                                                                |
| QA/QC procedures to be applied:                                                                  | According to national standard (DL/T448 – 2000), meters will be calibrated periodically. Data measured by meters will be cross checked by the electricity sales documents. |
| Any comment:                                                                                     |                                                                                                                                                                            |

|                                                                                                  |                                                                                                                          |
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| <b>Data / Parameter:</b>                                                                         | $TDL_y$                                                                                                                  |
| Data unit:                                                                                       | -                                                                                                                        |
| Description:                                                                                     | Average technical transmission and distribution losses for providing electricity to the North China Power Grid in year y |
| Source of data to be used:                                                                       | As scenario A is used, the 20% default value is chosen in accordance with ACM0006 version 06.2                           |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 20%                                                                                                                      |
| Description of measurement methods and procedures to be applied:                                 |                                                                                                                          |
| QA/QC procedures to                                                                              |                                                                                                                          |



|              |  |
|--------------|--|
| be applied:  |  |
| Any comment: |  |

|                                                                                                  |                                                                                                                                                                                                                                          |
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| <b>Data / Parameter:</b>                                                                         | -                                                                                                                                                                                                                                        |
| Data unit:                                                                                       | Tons                                                                                                                                                                                                                                     |
| Description:                                                                                     | Quantity of biomass residues of type k 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(FSR) 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 | 464,955 tons of maize stalk in a 50km radius around the plant<br>36,949 tons of soybean straw in a 50km radius around the plant                                                                                                          |
| 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 <sub>2</sub> is utilized to rule out leakage. In case other biomass types than maize stalk were combusted in project activity, their geographical utilization will be monitored similarly. |

|                                                                                                  |                                                                                                                                                                                                                            |
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| <b>Data / Parameter:</b>                                                                         | -                                                                                                                                                                                                                          |
| Data unit:                                                                                       | Tons                                                                                                                                                                                                                       |
| Description:                                                                                     | Quantity of biomass residues of type k in the region                                                                                                                                                                       |
| Source of data to be used:                                                                       | Surveys or statistics(FSR) 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 | 1,328,558 tons of maize straw within a 50km radius around the plant<br>105,569 tons of soybean straw within a 50km radius around the plant                                                                                 |
| 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 <sub>2</sub> is utilized to rule out leakage. In case other biomass types than maize stalk were combusted in project activity, their production will be monitored similarly. |

|                          |                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b> | $EC_{PJ,y}$                                                                            |
| Data unit:               | MWh per year                                                                           |
| Description:             | On-site electricity consumption attributable to the project activity during the year y |
| Source of data to be     | On-site measurements                                                                   |



|                                                                                                  |                                                                                                                                            |
|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| used:                                                                                            |                                                                                                                                            |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 2973.4 MWh per year                                                                                                                        |
| Description of measurement methods and procedures to be applied:                                 | Use electricity meters. The quantity shall be cross-checked with electricity purchase receipts. Continuously, aggregated at least annually |
| QA/QC procedures to be applied:                                                                  | Cross-check measurement results with invoices for purchased electricity if available.                                                      |
| Any comment:                                                                                     |                                                                                                                                            |

|                                                                                                  |                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                         | $EF_{CO2,LE}$                                                                                                                                                                                                                                                                                                                                           |
| Data unit:                                                                                       | tCO <sub>2</sub> /GJ                                                                                                                                                                                                                                                                                                                                    |
| Description:                                                                                     | CO <sub>2</sub> emission factor of the most carbon intensive fuel used in the country                                                                                                                                                                                                                                                                   |
| Source of data to be used:                                                                       | Identify the most carbon intensive fuel type from the national communication, other literature sources (e.g. IEA). Possibly consult with the national agency responsible for the national communication / GHG inventory. If available, use national default values for the CO <sub>2</sub> emission factor. Otherwise, IPCC default values may be used. |
| 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:                                 | Measured annually                                                                                                                                                                                                                                                                                                                                       |
| QA/QC procedures to be applied:                                                                  |                                                                                                                                                                                                                                                                                                                                                         |
| Any comment:                                                                                     |                                                                                                                                                                                                                                                                                                                                                         |

**NB: since the baseline is scenario 2,  $Q_{total,y}$ ,  $EG_{total,y}$  and  $EF_{CP,CO2}$  should not be monitored, which is compliant with the applied methodology.**

#### **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, which will be elaborated in the monitoring plan. The main framework is shown in Figure B-2 and details are shown below:

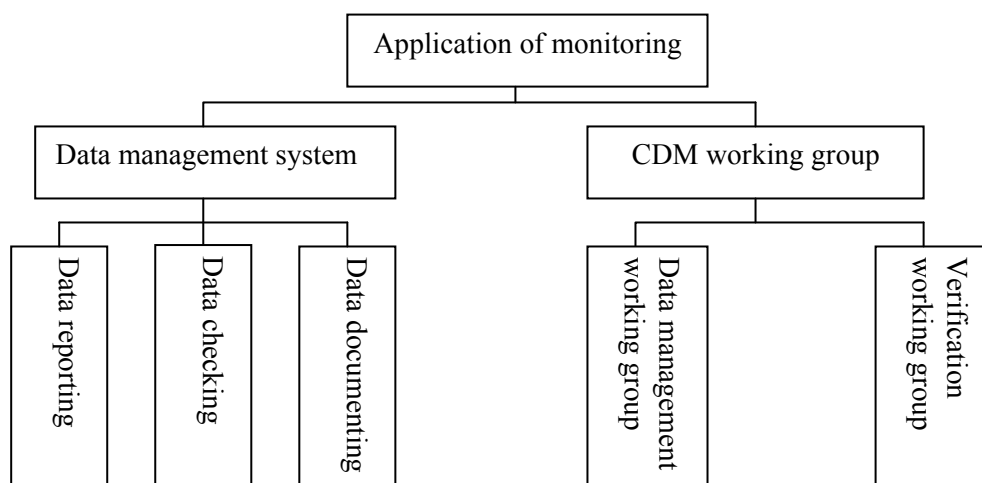


**Figure B-2 the main framework for application of monitoring**

### **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 project emissions 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 as backups. The information stored in the computer will be copied, and the copied files will be stored in storage or printed to be the paper-based documents as the backups. The working group will appoint the certain person to make sure the safety of both the original ones and backups.

## **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 proposed 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 proposed 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 proposed 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 study and monitoring methodology of the proposed project was completed on 22/02/2008. The persons involved in baseline and monitoring study is James Guo (Email: guojianjames@yahoo.com) from Beijing YuAn Century Control Engineering Tech Co., Ltd. the above persons and organization are 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:**

&gt;&gt;

08/02/2006 (Boiler purchase agreement)

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

&gt;&gt;

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:**

&gt;&gt;

10/07/2009, or the registration date, whichever is the latest

**C.2.1.2. Length of the first crediting period:**

&gt;&gt;

7 years

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

&gt;&gt;

Not applicable

**C.2.2.2. Length:**

&gt;&gt;

Not applicable

**SECTION D. Environmental impacts**

&gt;&gt;

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

&gt;&gt;

The Environmental Impact Statement Report was completed by the project owner, and approved by the Jilin Environmental Protection Bureau in January, 2006.

According to the Environmental Impact Statement Report, 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. Measures such as making reasonable arrangement of construction machines, setting up noise screen, employing low-noise equipment conducive to environmental protection, avoiding concrete mixing and construction during night and so on will be taken to minimize the impact of noises on the external environment.

***Dust***

Excavation and backfilling of earth, loading and unloading of raw materials, and transportation of vehicles during construction of the Project might generate dust and tail gas at the construction site and the surrounding area. Measures such as reasonable laying out storage space, covering powdered materials and so on will be taken to reduce the impact of dust on the surrounding area. Dust will automatically disappear after completion of the construction. The vehicles are operating on a discontinuous basis, and time during which pollutants are discharged is relatively short and the quantity of pollutant discharged relatively small. Moreover, since the exhaust stacks are relatively low, diffusion scope of tail gas is not large, and thus impact on the surrounding area is relatively small.

***Waste water***

Waste water generated during construction of the Project is mainly the residential waste water and part of the production waste water (43t/d). After the sedimentation of the construction waste water, the supernatant fluid will be used for farm irrigation, and the sludge will be set to the city landfill site for disposal.

***Solid waste***

Solid waste generated during construction of the Project is mainly building garbage, discarded earth and residential garbage. Building garbage and discarded earth will be cover with tarpaulin and collectively transported to designated places for landfill treatment. Residential garbage will be collected at the designated places and regularly cleared.

***Ecological environment and city landscape***

There is no wildwood and endangered species alongside the construction site, therefore, construction of the Project will not have long-term and destructive impact on the surrounding vegetation. Animals inhabiting in the area under evaluation of the Project are mainly small wild animals such as birds, snakes and rats, which have a relatively loose requirement on the growth environment and adapt well to human influence. These animals will migrate during construction and can return after completion of the construction. Construction of the Project will not disturb their normal life.



The Project will be constructed as a new industrial park. Multi-levelled artificial buildings will enhance the diversity of the landscape, which can form a multi-space landscape with stereoscopic effects. Although the landscape is different from the previous one featured by natural agricultural ecology, it satisfies the planning of the development zone, and its impact on the ecological landscape is acceptable.

### **Operation Phase**

#### ***Waste gas***

Air pollutants emitted during construction of the Project are largely flue gas, SO<sub>2</sub> and NO<sub>x</sub>. 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 4.0 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 <sup>3</sup> ) of <i>Emission standard of air pollutants for thermal power plants (GB13223-2003)</i> | Emission concentration of the Project (mg/m <sup>3</sup> ) |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| SO <sub>2</sub> | <400                                                                                                                          | 112.759                                                    |
| NO <sub>x</sub> | <450                                                                                                                          | 235                                                        |
| Flue gas        | <50                                                                                                                           | 5.07                                                       |

#### ***Noise***

Measures such as employing low-noise equipment, adopting noise damping, sound isolation and damping measures, establishing noise isolation belt, 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. Forecast of the noises within the plant area of the Project satisfies the limit requirement of standard III listed in the Standard of noise at boundary of industrial enterprises, and the noises during the operation will not have significantly harmful impacts on the acoustical environment quality of the surrounding area.

#### ***Waste water***

Various types of waste water of the Project will be treated based on the principles of separating clean water from dirty water and multi-usage of the water, and reused after the treatment. Residential waste water, acid-alkali wastewater, general industrial waste water and the like industrial waste water will be reused as ash-eliminating water, replenished water for recycled water and rinsing water. Only a small amount of waste water (2.65 m<sup>3</sup>/h) will be sent to Liaoyuan Sewage Disposal Plant for uniform treatment via the sewage pipe network of the development zone.

#### ***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. Residential garbage generation by the Project 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:**

>>

In Nov., 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.

Two staff delivered the questionnaires to the residents within Liaoyuan county randomly, especially the people living closed to the project site and the four storage sites, 50 questionnaires were delivered, and the whole process of the delivery and collection of the questionnaires are completed until the middle of Nov., 2006.

Comments received through the survey are summarized as follows. The government of Liaoyuan 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 distributing and collecting responses to a questionnaire. Totally 46 questionnaires returned out of 50 with 92% 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                | 36     | 78.26          |
| Female              | 10     | 21.74          |

| Structure of educational level |        |                |
|--------------------------------|--------|----------------|
| Educational level              | Number | Percentage (%) |
| Technical college and higher   | 3      | 6.52           |
| Senior high school             | 14     | 30.43          |
| Junior high school             | 24     | 52.17          |
| Elementary school              | 2      | 4.35           |
| Left blank                     | 3      | 6.52           |

| Structure of age |        |                |
|------------------|--------|----------------|
| Age              | Number | Percentage (%) |
| 20~30            | 4      | 8.70           |
| 31~40            | 17     | 36.96          |
| 41~50            | 13     | 28.26          |
| 51~60            | 11     | 23.91          |
| 61 and older     | 1      | 2.17           |

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 46 respondents:

- 45 respondents (97.83%) support the construction of the Project and 1 respondent (2.17%) left blank.
- Respondents consider that positive impacts possibly caused by the construction of the Project include



increased income (91.30%), increased employment opportunities (89.13%), improved living standards (84.78%) and reduction of air pollutants emission from decay and uncontrolled burning of biomass residues (73.91%).

- Respondents generally believe that construction of the Project will be conducive to the environmental protection and income increase for the farmers, a few respondents are concerned that implementation of the Project might cause an increase of fuel price (10.87%), increase of environmental pollution (8.70%), increase of waste water (6.52%) and increase of noise (2.17%).

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:

- The dominant fuel employed by the Project is biomass residue, while light diesel may be used only for ignition and on-site transportation, whose consumption is low and will not impact the fuel price of the project location.

- Implementation of the Project reduces the impact of low latitude unorganized emissions resulting from straw combustion on the environment, which contributes to the improvement of the regional environment; noises and waste water discharged of the Project both meet the requirement of the relevant law and regulations.

- Relatively complete noise protection measures have been designed for the Project, forecast of the noises within the plant area of the Project satisfies the limit requirement of standard III listed in the Standard of noise at boundary of industrial enterprises, and the noises during the operation will not have significantly harmful impacts on the acoustical environment quality of the surrounding area<sup>30</sup>.

- Various types of waste water of the Project will be treated based on the principles of separating clean water from dirty water and multi-usage of the water, and reused after the treatment. Waste water discharged by the Project is only 2.65 m<sup>3</sup>/h, and will be sent to Liaoyuan Sewage Disposal Plant for uniform treatment via the sewage pipe network of the development zone.

The project owner will strengthen the propagation to inform the stakeholders of the contribution of the Project implementation to the reduction of pollutants emissions and make them have a better understanding of the project and thus eliminate their worries.

---

<sup>30</sup> The Environmental Impact Statement Report of the Project.

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

|                  |                                                     |
|------------------|-----------------------------------------------------|
| Organization:    | National Bio Energy Co., Ltd.                       |
| Street/P.O.Box:  | No.26B, Financial Street, Xicheng District, Beijing |
| Building:        | Floor 9, Huashi Building                            |
| City:            | Beijing                                             |
| State/Region:    | -                                                   |
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| Country:         | P. R. China                                         |
| Telephone:       | +86 10 83582537                                     |
| FAX:             | +86 10 83582500                                     |
| E-Mail:          | gx@nbe.cn                                           |
| URL:             | -                                                   |
| Represented by:  |                                                     |
| Title:           | CDM Project Manager                                 |
| Salutation:      | Ms.                                                 |
| Last Name:       | Guo                                                 |
| Middle Name:     | -                                                   |
| First Name:      | Xin                                                 |
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|                  |                                    |
|------------------|------------------------------------|
| Organization:    | EDF Trading Limited                |
| Street/P.O.Box:  | 80 Victoria Street, Cardinal Place |
| Building:        | -                                  |
| City:            | London                             |
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| Country:         | United Kingdom                     |
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| E-Mail:          | -                                  |
| URL:             | www.edftrading.com                 |
| Represented by:  |                                    |
| Title:           | Head of EDF Trading Carbon         |
| Salutation:      | Mr.                                |
| Last Name:       | Joubert                            |
| Middle Name:     | -                                  |
| First Name:      | Francois                           |
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| Direct FAX:      | +44 207 061 5208                   |
| Direct tel:      | +44 207 061 4208                   |
| Personal E-Mail: | francois.joubert@edftrading.com    |



**Annex 2**

**INFORMATION REGARDING PUBLIC FUNDING**

There is no public funding for the proposed project.



### ANNEX 3 BASELINE INFORMATION

Table A3-1 ----Operating Margin for Northeast China Grid in 2002

| Fuel types                  | unit                                                                                                               | Provinces in the Regional Grid |            |                        | Subtotal    | Effective CO2 Emission Factor | average low Caloric value         | CO <sub>2</sub> emission |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------|------------|------------------------|-------------|-------------------------------|-----------------------------------|--------------------------|
|                             |                                                                                                                    | Liaoning                       | Jilin      | Heilongjiang           |             | (tCO <sub>2</sub> /TJ)        | (MJ/t,m <sup>3</sup> ,tce)        | (tCO <sub>2</sub> e)     |
| A                           | B                                                                                                                  | C                              | D          | E                      | F=C+D+E     | G                             | H                                 | =F*G*H                   |
| raw coal                    | Mtons                                                                                                              | 32.5852                        | 19.2897    | 24.2227                | 76.0976     | 94.6                          | 20908                             | 150513199.5              |
| cleaned coal                | Mtons                                                                                                              | 0.0145                         | 0          | 0.0931                 | 0.1076      | 94.6                          | 26344                             | 268154.5222              |
| other washed coal           | Mtons                                                                                                              | 3.4755                         | 0.1365     | 1.404                  | 5.016       | 94.6                          | 8363                              | 3968357.237              |
| coke                        | Mtons                                                                                                              | 0                              | 0          | 0                      | 0           | 94.6                          | 28435                             | 0                        |
| coke oven gas               | Mm <sup>3</sup>                                                                                                    | 189                            | 0          | 0                      | 189         | 44.4                          | 16.726                            | 140357.9016              |
| other coal gas              | Mm <sup>3</sup>                                                                                                    | 662                            | 0          | 0                      | 662         | 44.4                          | 5.227                             | 153636.1656              |
| crude oil                   | Mtons                                                                                                              | 0.0863                         | 0          | 0                      | 0.0863      | 73.3                          | 41816                             | 264519.2346              |
| gasoline                    | Mtons                                                                                                              | 0                              | 0          | 0                      | 0           | 69.3                          | 43070                             | 0                        |
| kerosene                    | Mtons                                                                                                              | 0                              | 0          | 0                      | 0           | 71.5                          | 43070                             | 0                        |
| diesel oil                  | Mtons                                                                                                              | 0.006                          | 0.01       | 0.0011                 | 0.0171      | 74.1                          | 42652                             | 54044.77572              |
| fuel oil                    | Mtons                                                                                                              | 0.2547                         | 0.0175     | 0.0831                 | 0.3553      | 77.4                          | 41816                             | 1149949.2                |
| LPG                         | Mtons                                                                                                              | 0.0004                         | 0          | 0                      | 0.0004      | 63.1                          | 50179                             | 1266.51796               |
| Refinery gas                | Mtons                                                                                                              | 0.0699                         | 0          | 0.0038                 | 0.0737      | 57.6                          | 46055                             | 195509.0016              |
| Natural gas                 | Mm <sup>3</sup>                                                                                                    | 0                              | 2          | 256                    | 258         | 56.1                          | 38.931                            | 563479.5078              |
| other petroleum products    | Mtons                                                                                                              | 0                              | 0          | 0                      | 0           | 73.3                          | 41816                             | 0                        |
| Other coking products       | Mtons                                                                                                              | 0                              | 0          | 0                      | 0           | 107                           | 28435                             | 0                        |
| fired electricity generated | TWh                                                                                                                | 65.22261                       | 24.0007446 | 41.0595832             | 130.2829378 |                               |                                   |                          |
| electricity imported        | TWh                                                                                                                |                                |            |                        | 0           |                               | Total tCO <sub>2</sub> e Emission | 157272473.6              |
| Result                      | a. total CO2 emission in Northeast China Grid(tCO <sub>2</sub> e)                                                  |                                |            |                        |             | 157272473.6                   |                                   |                          |
|                             | b. total generatoin in Northeast China Grid(TWh)                                                                   |                                |            |                        |             | 130.2829378                   |                                   |                          |
|                             | c. OM emission factor (tCO <sub>2</sub> /MWh)                                                                      |                                |            | (a/b/10 <sup>6</sup> ) |             | 1.207160939                   |                                   |                          |
| Data Source                 | Emission Factor and Oxidation Rate: IPCC 2006                                                                      |                                |            |                        |             |                               |                                   |                          |
|                             | Fuel Consumption ,Fire Generated Electricity Data and Average Low Caloric Value: China Energy Statistical Yearbook |                                |            |                        |             |                               |                                   |                          |
|                             | Electricity Imported: China Electric Power Yearbook                                                                |                                |            |                        |             |                               |                                   |                          |

Table A3-2 ----Operating Margin for Northeast China Grid in 2003



| Fuel types                  | unit                                                                                                               | Provinces in the Regional Grid |            |              | Subtotal    | Effective CO2 Emission Factor (tCO <sub>2</sub> /TJ) | average low Caloric value (MJ/t,m <sup>3</sup> ,tce) | CO <sub>2</sub> emisson (tCO <sub>2</sub> e) |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------|------------|--------------|-------------|------------------------------------------------------|------------------------------------------------------|----------------------------------------------|
|                             |                                                                                                                    | Liaoning                       | Jilin      | Heilongjiang |             |                                                      |                                                      |                                              |
| A                           | B                                                                                                                  | C                              | D          | E            | $F=C+D+E$   | G                                                    | H                                                    | $=F*G*H$                                     |
| raw coal                    | Mtons                                                                                                              | 35.5651                        | 20.0666    | 27.6362      | 83.2679     | 94.6                                                 | 20908                                                | 164695313                                    |
| cleaned coal                | Mtons                                                                                                              | 0.7083                         | 0          | 0.03         | 0.7383      | 94.6                                                 | 26344                                                | 1839948.734                                  |
| other washed coal           | Mtons                                                                                                              | 6.1704                         | 0.159      | 0.5341       | 6.8635      | 94.6                                                 | 8363                                                 | 5429988.017                                  |
| coke                        | Mtons                                                                                                              | 0                              | 0          | 0            | 0           | 94.6                                                 | 28435                                                | 0                                            |
| coke oven gas               | Mm <sup>3</sup>                                                                                                    | 166                            | 0          | 0            | 166         | 44.4                                                 | 16.726                                               | 123277.3104                                  |
| other gas                   | Mm <sup>3</sup>                                                                                                    | 531                            | 0          | 0            | 531         | 44.4                                                 | 5.227                                                | 123233.8428                                  |
| crude oil                   | Mtons                                                                                                              | 0.0339                         | 0          | 0            | 0.0339      | 73.3                                                 | 41816                                                | 103907.3239                                  |
| Gasoline                    | Mtons                                                                                                              | 0                              | 0          | 0            | 0           | 69.3                                                 | 43070                                                | 0                                            |
| Kerosene                    | Mtons                                                                                                              | 0                              | 0          | 0            | 0           | 71.5                                                 | 43070                                                | 0                                            |
| Diesel Oil                  | Mtons                                                                                                              | 0.0032                         | 0.0034     | 0            | 0.0066      | 74.1                                                 | 42652                                                | 20859.38712                                  |
| fuel oil                    | Mtons                                                                                                              | 0.1487                         | 0.007      | 0.0432       | 0.1989      | 77.4                                                 | 41816                                                | 643751.4658                                  |
| LPG                         | Mtons                                                                                                              | 0.0155                         | 0          | 0            | 0.0155      | 63.1                                                 | 50179                                                | 49077.57095                                  |
| Refinery gas                | Mtons                                                                                                              | 0.0403                         | 0          | 0.0046       | 0.0449      | 57.6                                                 | 46055                                                | 119109.2832                                  |
| Natural gas                 | Mm <sup>3</sup>                                                                                                    | 0                              | 4          | 447          | 451         | 56.1                                                 | 38.931                                               | 984997.1241                                  |
| Other Petroleum Products    | Mtons                                                                                                              | 0                              | 0          | 0            | 0           | 73.3                                                 | 41816                                                | 0                                            |
| Other Coking Products       | Mtons                                                                                                              | 0                              | 0          | 0            | 0           | 107                                                  | 28435                                                | 0                                            |
| fired electricity generated | TWh                                                                                                                | 76.4325088                     | 31.4027644 | 45.3920896   | 153.2273628 |                                                      | Total                                                | 174133463                                    |
| electricity imported        | TWh                                                                                                                |                                |            |              | 0           |                                                      |                                                      |                                              |
| Result                      | a. total CO2 emission in Northeast China Grid(tCO <sub>2</sub> e)                                                  |                                |            |              |             | 174133463                                            |                                                      |                                              |
|                             | b. total generation in Northeast China Grid(TWh)                                                                   |                                |            |              |             | 153.2273628                                          |                                                      |                                              |
|                             | c. OM emission factor (tCO <sub>2</sub> /MWh) (a/b/10 <sup>6</sup> )                                               |                                |            |              |             | 1.136438426                                          |                                                      |                                              |
| Data Source                 | Emission Factor and Oxidation Rate: IPCC 2006                                                                      |                                |            |              |             |                                                      |                                                      |                                              |
|                             | Fuel Consumption ,Fire Generated Electricity Data and Average Low Caloric Value: China Energy Statistical Yearbook |                                |            |              |             |                                                      |                                                      |                                              |
|                             | Electricity Imported: China Electric Power Yearbook                                                                |                                |            |              |             |                                                      |                                                      |                                              |

Table A3-3 ----Operating Margin for Northeast China Grid in 2004



| Fuel types                  | unit                                                                                                                                                                    | Provinces in the Regional Grid |            |                        | Subtotal    | Effective CO2 Emission Factor | average low Caloric value  | CO <sub>2</sub> emisson |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------|------------------------|-------------|-------------------------------|----------------------------|-------------------------|
|                             |                                                                                                                                                                         | Liaoning                       | Jilin      | Heilongjiang           |             | (tCO2/TJ)                     | (MJ/t,m <sup>3</sup> ,tce) | (tCO <sub>2</sub> e)    |
| A                           | B                                                                                                                                                                       | C                              | D          | E                      | F=C+D+E     | G                             | H                          | =F*G*H                  |
| raw coal                    | Mtons                                                                                                                                                                   | 41.442                         | 23.109     | 30.848                 | 95.399      | 94.6                          | 20908                      | 188689376.8             |
| cleaned coal                | Mtons                                                                                                                                                                   | 0.8475                         | 0.0109     | 0.0488                 | 0.9072      | 94.6                          | 26344                      | 2260871.585             |
| other washed coal           | Mtons                                                                                                                                                                   | 5.7767                         | 0.1426     | 0.61                   | 6.5293      | 94.6                          | 8363                       | 5165589.096             |
| coke                        | Mtons                                                                                                                                                                   | 0                              | 0          | 0                      | 0           | 94.6                          | 28435                      | 0                       |
| coke oven gas               | Mm <sup>3</sup>                                                                                                                                                         | 483                            | 291        | 0                      | 774         | 44.4                          | 16.726                     | 574799.0256             |
| other gas                   | Mm <sup>3</sup>                                                                                                                                                         | 5733                           | 419        | 0                      | 6152        | 44.4                          | 5.227                      | 1427748.778             |
| crude oil                   | Mtons                                                                                                                                                                   | 0                              | 0          | 0                      | 0           | 73.3                          | 41816                      | 0                       |
| Gasoline                    | Mtons                                                                                                                                                                   | 0                              | 0          | 0                      | 0           | 69.3                          | 43070                      | 0                       |
| Kerosene                    | Mtons                                                                                                                                                                   | 0                              | 0          | 0                      | 0           | 71.5                          | 43070                      | 0                       |
| Diesel Oil                  | Mtons                                                                                                                                                                   | 0.0204                         | 0.0116     | 0.0024                 | 0.0344      | 74.1                          | 42652                      | 108721.6541             |
| fuel oil                    | Mtons                                                                                                                                                                   | 0.1281                         | 0.0178     | 0.0286                 | 0.1745      | 77.4                          | 41816                      | 564779.4408             |
| LPG                         | Mtons                                                                                                                                                                   | 0.0219                         | 0          | 0                      | 0.0219      | 63.1                          | 50179                      | 69341.85831             |
| Refinery gas                | Mtons                                                                                                                                                                   | 0.0979                         | 0          | 0.0114                 | 0.1093      | 57.6                          | 46055                      | 289947.5424             |
| Natural gas                 | Mm <sup>3</sup>                                                                                                                                                         | 0                              | 3          | 253                    | 256         | 56.1                          | 38.931                     | 559111.4496             |
| Other Petroleum Products    | Mtons                                                                                                                                                                   | 0                              | 0          | 0                      | 0           | 73.3                          | 41816                      | 0                       |
| Other Coking Products       | Mtons                                                                                                                                                                   | 0                              | 0          | 0                      | 0           | 107                           | 28435                      | 0                       |
| fired electricity generated | TWh                                                                                                                                                                     | 78.4474497                     | 30.6890144 | 49.2890112             | 158.4254753 |                               | Total                      | 199710287.3             |
| electricity imported        | TWh                                                                                                                                                                     |                                |            |                        | 0           |                               |                            |                         |
| Result                      | a. total CO2 emission in Northeast China Grid(tCO2e)                                                                                                                    |                                |            |                        |             | 199710287.3                   |                            |                         |
|                             | b. total generation in Northeast China Grid(TWh)                                                                                                                        |                                |            |                        |             | 158.4254753                   |                            |                         |
|                             | c. OM emission factor (tCO2/MWh)                                                                                                                                        |                                |            | (a/b/10 <sup>6</sup> ) |             | 1.260594528                   |                            |                         |
| Data Source                 | Emission Factor and Oxidation Rate: IPCC 2006                                                                                                                           |                                |            |                        |             |                               |                            |                         |
|                             | Fuel Consumption ,Fire Generated Electricity Data and Average Low Caloric Value: China Energy Statistical Yearbook; Electricity Imported: China Electric Power Yearbook |                                |            |                        |             |                               |                            |                         |

**Table A3-4----CO2 Emission Factor for Best Commercially Available Technology**

| A                                                            | B                                                                                                       | C                                                      | D                                       | E                                       | F                                    |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-----------------------------------------|-----------------------------------------|--------------------------------------|
| CO <sub>2</sub> Emission Factor tCO <sub>2</sub> /GJ         | Fuel Energy Value GJ/tSCE                                                                               | CO <sub>2</sub> Emission Factor tCO <sub>2</sub> /tSCE | Coservative efficiency factor (gce/kWh) | Coservative efficiency factor (tce/MWh) | Emissions Rate tCO <sub>2</sub> /MWh |
| 2006 IPCC Guidelines for National Greenhouse Gas Inventories | The General Code for Comprehensive Energy Consumption Calculation (Chinese National Standard GB2589-81) | =A*B                                                   | see Table 6-1                           | =I6/1000;<br>g->ton;<br>kWh->MWh;       | =F6*H6                               |
| 0.094600                                                     | 29.270000                                                                                               | 2.768942                                               | 320.000000                              | 0.320000                                | 0.886061                             |
| * SCE: Standard Coal Equivalent                              |                                                                                                         |                                                        |                                         |                                         |                                      |

**Table A3-5----Installed capacities of 3 provinces (1997)**

|                                | Installed capacities (MW) |         |         |       |         |
|--------------------------------|---------------------------|---------|---------|-------|---------|
|                                | Hydro                     | Coal    | Nuclear | Other | Total   |
| Liaoning                       | 1220.9                    | 11191   | 0       | 0     | 12411.9 |
| Jilin                          | 3246.1                    | 4253.1  | 0       | 0     | 7499.2  |
| Heilongjiang                   | 637.9                     | 8794.1  | 0       | 0     | 9147.2  |
| Total                          | 5084.9                    | 23973.4 | 0       | 0     | 29058.3 |
| Proportion in total capacities | 0.175                     | 0.825   | 0.000   | 0.000 | 1.000   |

*Data Source: China Electric Power Yearbook 1998, P674***Table A3-6----Installed capacities of 3 provinces (1998)**

|                                | Installed capacities (MW) |         |         |       |         |
|--------------------------------|---------------------------|---------|---------|-------|---------|
|                                | Hydro                     | Coal    | Nuclear | Other | Total   |
| Liaoning                       | 1223.1                    | 12560.3 | 0       | 17    | 13800.4 |
| Jilin                          | 3474.7                    | 4428.6  | 0       | 0     | 7903.3  |
| Heilongjiang                   | 784.5                     | 9116    | 0       | 0     | 9900.5  |
| Total                          | 5482.3                    | 26104.9 | 0       | 17    | 31604.2 |
| Proportion in total capacities | 0.173                     | 0.826   | 0.000   | 0.001 | 1.000   |

*Data Source: China Electric Power Yearbook 1999, P551***Table A3-7----Installed capacities of 3 provinces (1999)**

|                                | Installed capacities (MW) |         |         |       |         |
|--------------------------------|---------------------------|---------|---------|-------|---------|
|                                | Hydro                     | Coal    | Nuclear | Other | Total   |
| Liaoning                       | 1240                      | 12425.7 | 0       | 22.9  | 13688.6 |
| Jilin                          | 3508.2                    | 4583.1  | 0       | 0     | 8091.3  |
| Heilongjiang                   | 774.5                     | 10128.1 | 0       | 0     | 10902.6 |
| Total                          | 5522.7                    | 27136.9 | 0       | 22.9  | 32682.5 |
| Proportion in total capacities | 0.169                     | 0.830   | 0.000   | 0.001 | 1.000   |

*Data Source: China Electric Power Yearbook 2000, P572***Table A3-8----Installed capacities of 3 provinces (2000)**

|                                | Installed capacities (MW) |         |         |       |         |
|--------------------------------|---------------------------|---------|---------|-------|---------|
|                                | Hydro                     | Coal    | Nuclear | Other | Total   |
| Liaoning                       | 1248.5                    | 13937.9 | 0       | 43.9  | 15230.3 |
| Jilin                          | 3536.7                    | 4894.6  | 0       | 30    | 8641.3  |
| Heilongjiang                   | 814.8                     | 10069.9 | 0       | 0     | 10884.7 |
| Total                          | 5600                      | 28902.4 | 0       | 73.9  | 34576.3 |
| Proportion in total capacities | 0.162                     | 0.836   | 0.000   | 0.002 | 1.000   |

**Table A3-9----Installed capacities of 3 provinces (2001)**

|          | Installed capacities (MW) |        |         |       |         |
|----------|---------------------------|--------|---------|-------|---------|
|          | Hydro                     | Coal   | Nuclear | Other | Total   |
| Liaoning | 1261.8                    | 14078  | 0       | 64    | 15230.3 |
| Jilin    | 3575.6                    | 5299.7 | 0       | 0     | 8641.3  |



|                                       |        |         |       |       |         |
|---------------------------------------|--------|---------|-------|-------|---------|
| <b>Heilongjiang</b>                   | 814.8  | 10462   | 0     | 0     | 10884.7 |
| <b>Total</b>                          | 5652.2 | 29839.7 | 0     | 64    | 34576.3 |
| <b>Proportion in total capacities</b> | 0.159  | 0.839   | 0.000 | 0.002 | 1.000   |

*Data Source: China Electric Power Yearbook 2002, P616*

**Table A3-10----Installed capacities of 3 provinces (2002)**

|                                       | Installed capacities (MW) |         |         |       |         |
|---------------------------------------|---------------------------|---------|---------|-------|---------|
|                                       | Hydro                     | Coal    | Nuclear | Other | Total   |
| <b>Liaoning</b>                       | 1261.4                    | 14389.9 | 0       | 78.5  | 15729.8 |
| <b>Jilin</b>                          | 3573.9                    | 5365.3  | 0       | 0     | 8939.2  |
| <b>Heilongjiang</b>                   | 806.8                     | 10758.9 | 0       | 0     | 11565.7 |
| <b>Total</b>                          | 5642.1                    | 30514.1 | 0       | 78.5  | 36234.7 |
| <b>Proportion in total capacities</b> | 0.162                     | 0.836   | 0.000   | 0.002 | 1.000   |

*Data Source: China Electric Power Yearbook 2003, P593*

**Table A3-11----Installed capacities of 3 provinces (2003)**

|                                       | Installed capacities (MW) |         |         |       |         |
|---------------------------------------|---------------------------|---------|---------|-------|---------|
|                                       | Hydro                     | Coal    | Nuclear | Other | Total   |
| <b>Liaoning</b>                       | 1396.2                    | 14816.4 | 0       | 137.5 | 16350.1 |
| <b>Jilin</b>                          | 3585.8                    | 5792.6  | 0       | 30.1  | 9408.5  |
| <b>Heilongjiang</b>                   | 834.6                     | 11054.4 | 0       | 0     | 11889   |
| <b>Total</b>                          | 5816.6                    | 31663.4 | 0       | 167.6 | 37647.6 |
| <b>Proportion in total capacities</b> | 0.155                     | 0.841   | 0.000   | 0.004 | 1.000   |

*Data Source: China Electric Power Yearbook 2004, P708*

**Table A3-12----Installed capacities of 3 provinces (2004)**

|                                       | Installed capacities (MW) |         |         |       |         |
|---------------------------------------|---------------------------|---------|---------|-------|---------|
|                                       | Hydro                     | Coal    | Nuclear | Other | Total   |
| <b>Liaoning</b>                       | 1404.1                    | 14960.3 | 0       | 142   | 16506.4 |
| <b>Jilin</b>                          | 3601.2                    | 5958.7  | 0       | 36.1  | 9596    |
| <b>Heilongjiang</b>                   | 844.6                     | 11259.1 | 0       | 39.3  | 12143   |
| <b>Total</b>                          | 5849.9                    | 32178.1 | 0       | 217.4 | 38245.4 |
| <b>Proportion in total capacities</b> | 0.153                     | 0.841   | 0.000   | 0.006 | 1.000   |

*Data Source: China Electric Power Yearbook 2005, P473*



**Table A3-13----Installed capacities of Northeast China Grid**

|                             | A                  | B                  | C                  | D                  | E                  | F                  | G                  | H                  |
|-----------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|                             | Capacities<br>1997 | Capacities<br>1998 | Capacities<br>1999 | Capacities<br>2000 | Capacities<br>2001 | Capacities<br>2002 | Capacities<br>2003 | Capacities<br>2004 |
|                             | MW                 | MW                 | MW                 | MW                 | MW                 | MW                 | MW                 | MW                 |
| <b>Hydro</b>                | 5084.9             | 5482.3             | 5522.7             | 5600.0             | 5652.2             | 5642.1             | 5816.6             | 5,849.9            |
| <b>Coal</b>                 | 23973.4            | 26104.9            | 27136.9            | 28902.4            | 29839.7            | 30514.1            | 31663.4            | 32,178.1           |
| <b>Nuclear</b>              | 0                  | 0                  | 0                  | 0                  | 0                  | 0                  | 0                  | 0.0                |
| <b>Other (wind)</b>         | 0                  | 17                 | 22.9               | 73.9               | 64                 | 78.5               | 167.6              | 217.4              |
| <b>Total / %<br/>Change</b> | 29058.3            | 31604.2            | 32682.5            | 34576.3            | 35555.9            | 36234.7            | 37647.6            | 38245.4            |

**Table A3-14----Incremental installed capacity from 1997 to 2004**

|                             | F                                         | G                        | H                                         | I                        | J                                         | K                        | L                                      | M                        |
|-----------------------------|-------------------------------------------|--------------------------|-------------------------------------------|--------------------------|-------------------------------------------|--------------------------|----------------------------------------|--------------------------|
|                             | New<br>Capacity<br>Additions<br>2004-2000 | Split of New<br>Capacity | New<br>Capacity<br>Additions<br>2004-1999 | Split of New<br>Capacity | New<br>Capacity<br>Additions<br>2004-1998 | Split of New<br>Capacity | New Capacity<br>Additions<br>2004-1997 | Split of New<br>Capacity |
|                             | MW                                        | %                        | MW                                        | %                        | MW                                        | %                        | MW                                     | %                        |
| <b>Hydro</b>                | 249.9                                     | 6.81%                    | 327.2                                     | 5.88%                    | 367.6                                     | 5.54%                    | 765.0                                  | 8.33%                    |
| <b>Coal</b>                 | 3,275.7                                   | 89.28%                   | 5,041.2                                   | 90.62%                   | 6,073.2                                   | 91.45%                   | 8,204.7                                | 89.31%                   |
| <b>Nuclear</b>              | 0.0                                       | 0.00%                    | 0.0                                       | 0.00%                    | 0.0                                       | 0.00%                    | 0.0                                    | 0.00%                    |
| <b>Other<br/>(wind)</b>     | 143.5                                     | 3.91%                    | 194.5                                     | 3.50%                    | 200.4                                     | 3.02%                    | 217.4                                  | 2.37%                    |
| <b>Total / %<br/>Change</b> | 3,669.1                                   | <b>9.6%</b>              | 5,562.9                                   | <b>14.5%</b>             | 6,641.2                                   | <b>17.4%</b>             | 9,187.1                                | <b>24.0%</b>             |



Table A3-15----Calculation of BM emission factor of Northeast China Grid

|              | I                     | L                     | M=I*L                                          |
|--------------|-----------------------|-----------------------|------------------------------------------------|
|              | Split of New Capacity | Emissions Factor      | Weighted Average Build Margin Emissions Factor |
|              | %                     | tCO <sub>2</sub> /MWh | tCO <sub>2</sub> /MWh                          |
| Hydro        | 8.33%                 | 0.000                 | 0.000                                          |
| Coal         | 89.19%                | 0.886                 | <b>0.790</b>                                   |
| Nuclear      | 0.00%                 | 0.000                 | 0.000                                          |
| Other (wind) | 2.37%                 | 0.000                 | 0.000                                          |

*\*Emission Factor calculated based on Table A16*



**Annex 4**

**MONITORING INFORMATION**

No additional information