**Monitoring report form**

**(Version 04.0)**

*Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.*

| MONITORING REPORT | |
|---|---|
| **Title of the project activity** | Zhumadian Zhongyuan Gas-Steam Combined Cycle Power Project in Henan China |
| **Reference number of the project activity** | 2344 |
| **Version number of the monitoring report** | 02 |
| **Completion date of the monitoring report** | 21/10/2014 |
| **Registration date of the project activity** | 25/08/2009 |
| **Monitoring period number and duration of this monitoring period** | 6th periodic monitoring period<br>01/12/2011 - 30/06/2013(both days included) |
| **Project participant(s)** | Huaneng Henan Zhongyuan Gas Power Company Ltd.<br>Carbon Asset Management Sweden AB (Sweden)<br>Carbon Asset Management Sweden AB(Switzerland) |
| **Host Party(ies)** | P.R.China. |
| **Sectoral scope and selected methodology(ies), and where applicable, applied standardized baseline(s)** | Sectoral Scope: 1 Energy industries (non-renewable sources)<br>AM0029, Version 03: "Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas" |
| **Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD** | 1,358,957 |
| **Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period** | 396,122 |
| **Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31 December 2012(if applicable)** | 263,665 |
| **Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period from 1 January 2013 onwards (if applicable).** | 132,457 |

# SECTION A. Description of project activity

## A.1. Purpose and general description of project activity

>>

As described in PDD, the Zhumadian Zhongyuan Gas-Steam Combined Cycle Power Project in Henan China (hereinafter referred as the Project) is located at the southeast corner of the Zhumadian City, Henan Province, China. The designed installed capacity of the proposed project is 2×377.2MW, which is aimed to deliver 2,584.4235GWh electricity per year to the Central China Power Grid (CCPG). The Central China Power Grid is dominated by coal-fired power plants. By displace equal amount of electricity generated by coal-fired thermal power plants which would have been built otherwise, greenhouse gas (GHG) emission reductions could be achieved. The estimated annual GHG emission reductions are 858,165 $tCO_2e$.

The NGCC technology adopted in the project consists of two phases of combined dynamic cycles for electricity generation: Gas Cycle and Steam Cycle. Two phases of the cycles are combined to generate electricity with quite high efficiency.

The construction staring date of the project is 10/08/2005; the commenced electricity generation of the gas turbine #1 is in June 2007, and the commenced electricity generation of the gas turbine #2 is in December 2007. The commenced electricity generation of the steam turbine #1 is in August 2007 and the steam turbine #2 is in January 2008.

The current monitoring period is the 6th period that covers 01/12/2011-30/06/2013 including 578 days.

The total Emission Reductions achieved by the project in this period is 396,122 $tCO_2e$.

## A.2. Location of project activity

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The proposed project is located at the planned industrial zone in the southeast corner of the Zhumadian City, Henan Province, China.

The geographic coordinate of the project site is situated as:

North-west corner: East longitude 114°03’39” North latitude 32°57’31”

South-west corner: East longitude 114°03’39” North latitude 32°57’22”

South-east corner: East longitude 114°03’52” North latitude 32°57’22”

North-east corner: East longitude 114°03’52” North latitude 32°57’31”

The geographic coordinate of the mark points within the project site are situated as

1＃Cooling tower: East longitude 114°03’41” North latitude 32°57’24”

2＃Cooling tower: East longitude 114°03’46” North latitude 32°57’24”

1＃Boiler stack: East longitude 114°03’48” North latitude 32°57’27”

2＃Boiler stack: East longitude 114°03’48” North latitude 32°57’29”

## A.3. Parties and project participant(s)

| Party involved ((host) indicates a host Party) | Private and/or public entity(ies) project participants (as applicable) | Indicate if the Party involved wishes to be considered as project participant (Yes/No) |
|---|---|---|
| P.R.China. | Huaneng Henan Zhongyuan Gas Power Company Ltd. | No |
| Sweden | Carbon Asset Management Sweden AB | No |
| Switzerland | Carbon Asset Management Sweden AB | No |

## A.4. Reference of applied methodology and standardized baseline

>>

The approved baseline methodology AM0029, Version 03: “Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas” and the approved monitoring methodology AM0029, Version 03: “Grid Connected Electricity Generation Plants using Non-Renewable and Less GHG Intensive Fuel” are applied to the project activity. The AM0029 also uses the “Tool to Calculate the Emission Factor for an Electricity System”, Version 01 and “Tool for the Demonstration and Assessment of Additionality”, Version 05 agreed by CDM EB.
More information about the methodology and the methodological tools can be found on the website: http://cdm.unfccc.int/methodologies/approved

### A.5. Crediting period of project activity

>>
The proposed project activity applies the renewable crediting period (7years×3). The starting date of the first crediting period is 25/08/2009 (i.e. the registration date of the proposed project). The first crediting period of the proposed project is 25/08/2009-24/08/2016 (7years).

### A.6. Contact information of responsible persons/ entities

>>
Mr. Zhiqiang Chen

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Ms. Xiaochao Lai
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Beijing MD Energy Technology Co. Ltd.
Address: Room 17-F, International Metro Cetro,A No.3, Chaoyang District, Beijing, P.R. China.
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Fax: +86 (0)10-65583298
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## SECTION B. Implementation of project activity

### B.1. Description of implemented registered project activity

>>

The NGCC technology adopted in the project consists of two phases of combined dynamic cycles: the first phase takes place in the gas turbine where the high temperature gas with about 1400°C generated by the natural gas combustion can power to rotate a coupled AC power generator to generate electricity - this is the Gas Cycle. In the second phase, the exhausted gas discharged from the gas turbine with about 600 °C can generate steam with 540°C temperature and 10.67MPa pressure in a heat recovery boiler, which then expands in the followed up steam turbine to generate electric power in the AC power generator again - this is the Steam Cycle. Two phases of the cycles is combined to generate electricity with quite high efficiency. The electricity generated by the project is delivered to the Central China Power Grid through 500 kV transmission line.

The technical performance indicators of the advanced technologies employed in the project are listed in the table below.

**Table B.1 Technical Performance Indicators**

| **Gas Turbine** | |
|---|---|
| Manufacturer and Country of origin | Siemens Co. in Germany |

| | | |
|---|---|---|
| Type | V94.3A[1] | |
| Rated speed | rpm | 3000 |
| Flow rate of flue gas at the gas turbine | t/h | 2396.5 |
| Temperature of flue gas at the gas turbine | °C | 586.5 |
| Gas turbine output | MW | 243.4 |
| **Steam Turbine** | | |
| Manufacturer and Country of origin | Shanghai Steam Turbine Co., Ltd. | |
| Type | TCF-1 | |
| Rated Speed | rpm | 3000 |
| Steam turbine output | MW | 133.8 |
| **HRSG in Combined Cycle** | | |
| Manufacturer and Country of origin | Wuhan Boiler Manufacture Co. | |
| Feed water temperature of HRSG | °C | 55 |
| Output of generator | MVA | 478 |
| **Generator** | | |
| Manufacturer and country of origin | Shanghai Elec. Group Co. | |
| Rated voltage | KV | 21 |
| Rated current | A | 13142 |
| Rated frequency | Hz | 50 |
| Rated speed | rpm | 3000 |
| Total output for one set | MW | 377.2 |

The technology process was shown in the diagram below:

[1] During the 1st periodic verification, a slight deviation about the gas turbine type has been observed. The type of the gas turbine was V94.3A instead of TCF1 described in the registered PDD.

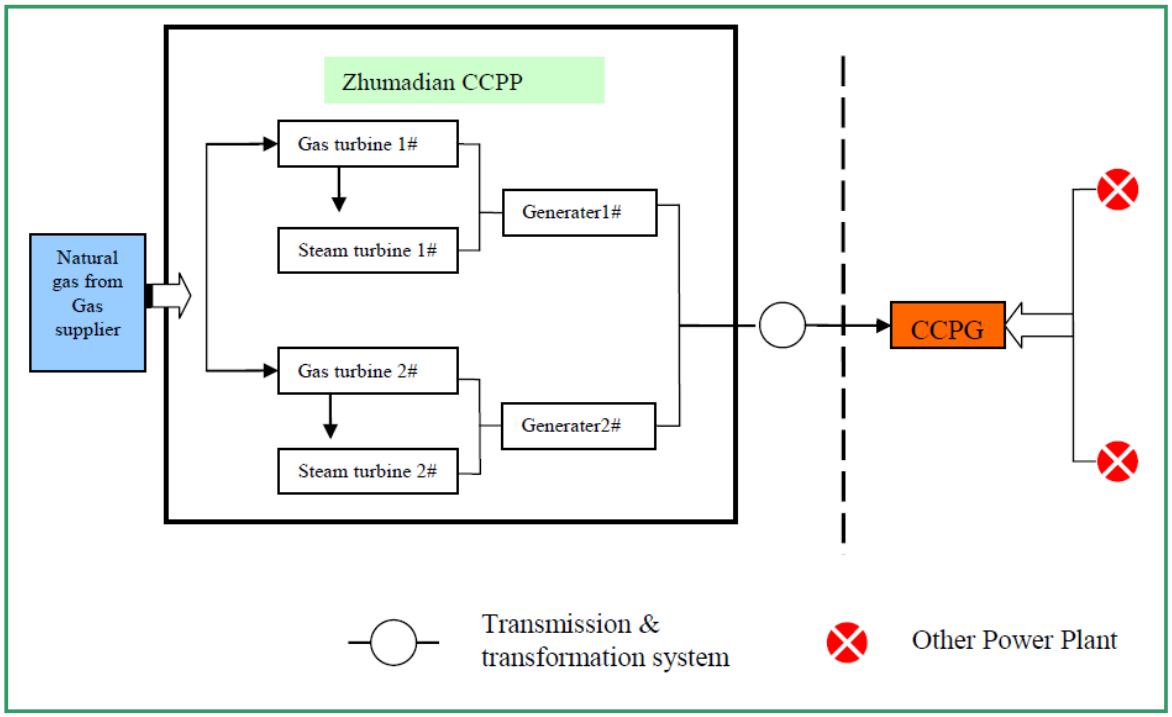


Diagram B.1 Technology Process

## B.2. Post registration changes

### B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

>>
There is no temporary deviation from registered monitoring plan or applied methodology.

### B.2.2. Corrections

>>
There is no correction.

### B.2.3. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

>>
There is no permanent change from registered monitoring plan or applied methodology.

### B.2.4. Changes to project design of registered project activity

>>
There is no change to project design of registered project activity.

### B.2.5. Changes to start date of crediting period

>>
There is no change to start date of crediting period.

### B.2.6. Types of changes specific to afforestation or reforestation project activity

>>

Not applicable.

## SECTION C. Description of monitoring system

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C.1 Metering System

As described in PDD, two bidirectional meter No.1 and meter No.2 (Backup meter to meter No.1) were installed as gateway meters at 500kV Chaya substation for automatically measuring the exported and imported electricity by the proposed project. The meter No.3 was installed at the high voltage side of the 110KV/6KV transformer at the project site is used for measuring the import-grid electricity purchased. The total net electricity delivered to the grid is calculated based on readings from meter No.1 and meter No.3.

As described in PDD, the main gas metering point is set up in front of the natural gas delivery point, where two gas flow meters are installed (#1 and #2). Meanwhile, behind the natural gas delivery point, two cross-check ultrasonic flow meters (#3 and #5) are installed before the gas inlet for unit 1# and 2# at the project site. Ultrasonic Meter #4 and #6 has also been installed before #3 and #5 as their further backup meters.

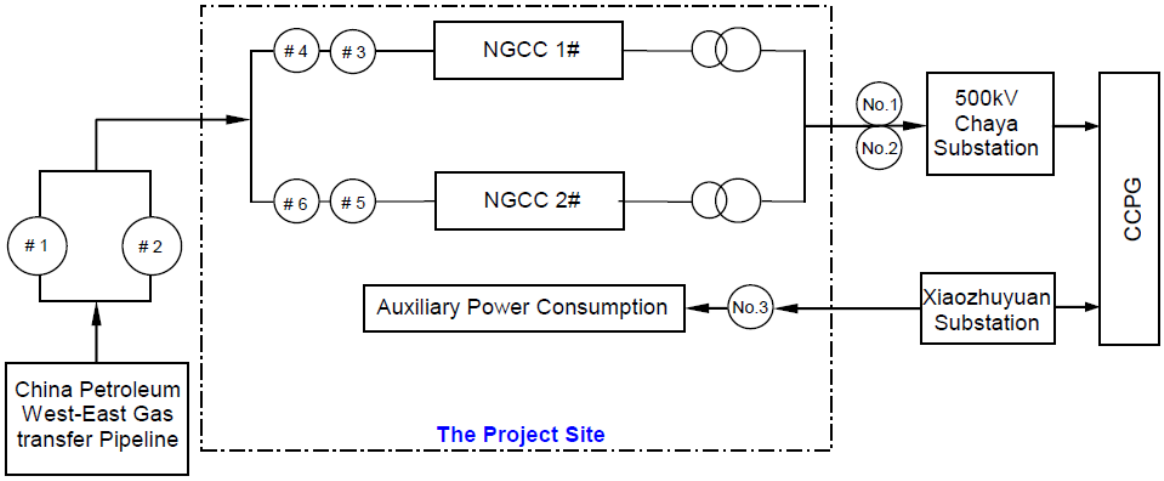


**Diagram C.1 Electric and Nature Gas Monitoring System**

The value of natural gas NCV is measured by an on-line gas chromatography analyzer.

C.2 Data Collection

The representatives from the project owner and the grid company have read the gateway meter meter No.1 and the meter No.3 on the last day of every month and the data has been recorded by the hard & soft means for monitoring, verifying, billing and cross checking. During this monitoring period, no abnormal difference has been found regarding calculation of emission reduction.

According to “GBT 18603-2001(Technical requirements of measuring systems for natural)”, natural gas is measured by volume under the normal condition of 20°C (293.15K) and absolute pressure 101.325KPa (one standard atmospheric pressure). The gas supplier and the project owner have verified the amount of natural gas supplied and consumed based on the reading from Gas meter #1 and #2 currently installed at the Zhumadian gas supply terminal, which are approved by both sides. The natural gas consumption has been recorded daily and cross-checked with receipt.

The measurement of NCV is conducted by an on-line gas chromatography analyzer by China Petroleum West-East Gas Transfer Pipeline Company Henan Province Xuedian Branch Station (GB/T-13610-2003), the value of NCV is recorded every ten days.

Everything worked fine during this monitoring period. No mistakes have been detected in the data collection process during this monitoring period.

C.3 Monitoring Group & QA/QC

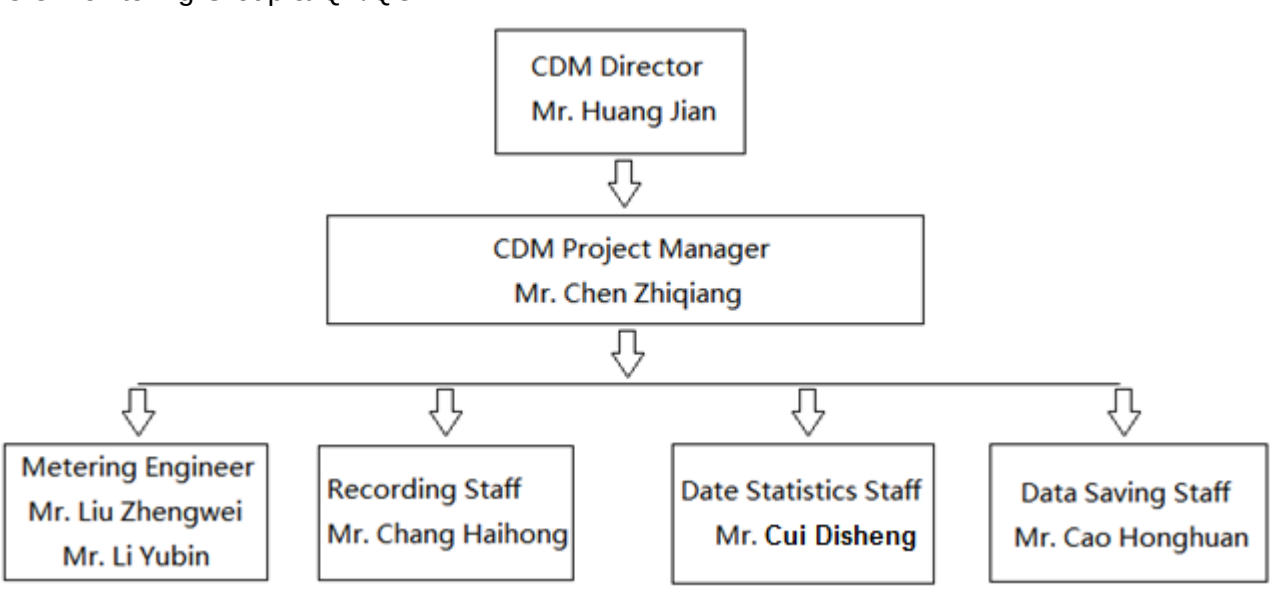


Figure C.2 Monitoring Group

Mr. Huang Jian, the Director of the proposed project exercised oversight on behalf of the Chairman. The CDM Project Manager is Mr. Chen Zhiqiang who is responsible for monitoring plan implementation.

Mr. Liu Zhengwei and Mr. Li Yubin is responsible for Meters' operation and calibration.

Mr. Chang Haihong is in charge of the data recording.

Mr. Cui Disheng[2] is in charge of data statistics.

Mr. Cao Honghuan is responsible for data saving.

All electricity meters installed have been calibrated by certified Parties quarterly in accordance with manufacturer's recommendations and National Regulations (SD109-83 & JJG569-1999) for ensuring reliability of the system. Calibrations have been evidenced with certificates of calibration for the relevant meters issued by the qualified third party.

The calibration and testing for the natural gas metering devices and the on-line gas chromatography was conducted periodically according to the national measurement standard and regulation (JJG1029-2007, JJG1037-2008, JG-700 1999) by the qualified measurement technology verification institution authorized by the Chinese government.

In summary, during this monitoring period, all meters and devices have been working normally and calibrated according to the registered monitoring plan and relevant national standards. All the involved staffs have been properly trained according to the Project Operation Manual and the CDM Monitoring Manual.

C.4 Emergency & Trouble Solving Procedure

Once error or emergency issue occurred during the operation and monitoring of the project, regulations on the Project Operation Manual and the CDM Monitoring Manual will be followed.

If any errors are detected the party owning the meters shall repaire, recalibrate or replace the meter and giving the other party sufficient notice to allow a representative to attend during any corrective activity. If the readings of the main meter are beyond allowable error, the backup meter will be used; if the readings of both the main meter and the backup meter are beyond allowable error, the project owner and Power Grid Company shall jointly prepare a reasonable and conservative estimate of the correct reading.

[2] In order to manage the data better, the project owner made some personnel adjustment in the end of the year 2011. The person charged of data statistics has been changed to Cui Disheng from Li Yalan and Yang Fuhua mentioned in registered PDD.

In any case there is any problem for the meters, the relevant third party is responsible to repair, recalibrate or replace the meters. After handling of the emergency, the project owner must prepare a report regarding the emergency to explain to DOE that the handling method is reasonable.
All data of the monitoring of the project will be stored for more than two years after the end of the crediting period. Once an error occurred, these stored data will be the backup information for monitoring. No error occurred during this monitoring period.

## SECTION D. Data and parameters

### D.1. Data and parameters fixed ex ante or at renewal of crediting period

| **Data / Parameter:** | **$EF_{Coal,upstream,CH4}$** |
|---|---|
| Unit: | t $CH_4$/kt coal |
| Description: | Emission Factor for upstream fugitive methane emissions from coal production. |
| Source of data: | Revised 1996 IPCC Guideline Vol.3, default value, as required by AM0029, version 03. |
| Value(s) applied): | 13.4 |
| Purpose of data: | Data used for Leakage Emission Calculation |
| Additional comment: | |

| **Data / Parameter:** | **$EF_{oil,upstream,CH4}$** |
|---|---|
| Unit: | t $CH_4$/PJ |
| Description: | Emission Factor for upstream fugitive methane emissions from crude oil production, transportation, refining and storage processes. |
| Source of data: | Revised IPCC 1996 Guidance default value, Tables 1-60 to 1-64, p.1.129 - 1.131 |
| Value(s) applied): | 4.1 |
| Purpose of data: | Data used for Leakage Emission Calculation |
| Additional comment: | |

| **Data / Parameter:** | **$EF_{NG,upstream,CH4}$** |
|---|---|
| Unit: | t $CH_4$/PJ |
| Description: | Emission Factor for upstream fugitive methane emissions of natural gas from production, transportation, distribution, and, in the case of LNG, liquefaction, transportation, re-gasification and compression into a transmission or distribution system. |
| Source of data: | Revised IPCC 1996 Guidance default value, Tables 1-63 to 1-64, p.1.130 - 1.131 |
| Value(s) applied): | 296 |
| Purpose of data: | Data used for Leakage Emission Calculation |
| Additional comment: | |

| **Data / Parameter:** | **$GWP_{CH4}$** |
|---|---|
| Unit: | t $CO_2e/tCH_4$ |
| Description: | Global Warming Potential for methane |

| | |
|---|---|
| Source of data: | IPCC Default value of 21 ;<br>The default value of 25 has been applied according to COP/MOP decision: "Standard for application of the global warming potentials to CDM project activities and PoAs for the second commitment period of the Kyoto Protocol" |
| Value(s) applied): | 21 (Before 01/01/2013)<br>25 (From 01/01/2013) |
| Purpose of data: | Data used for Leakage Emission Calculation |
| Additional comment: | |

## D.2. Data and parameters monitored

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

| **Data / Parameter:** | **$FC_{NG,y}$** | | |
|---|---|---|---|
| Unit: | $Nm^3$<br>(Volume unit $Nm^3$ measured under the normal condition of 20°C (293.15K) and absolute pressure 101.325KPa (one standard atmospheric pressure). | | |
| Description: | Quantity of natural gas consumed in project activity | | |
| Measured/ Calculated / Default: | Measured. | | |
| Source of data: | Both the NG flow meter 1# and 2# readings at the power supplier terminal | | |
| Value(s) of monitored parameter: | 809,496,405 | | |
| Monitoring equipment: | Gas flow meter | 1# | 2# |
| | Type | TRZ-IFSG14000DN300ANSI600 | |
| | Accuracy class | 1.0 | |
| | Serial number | 83034891 | 83034059 |
| | Calibration frequency | every 1yr | |
| | Calibration date | 29/11/2011<br>26/11/2012 | 09/10/2011<br>28/09/2012 |
| | Validity | 28/11/2012<br>25/11/2013 | 08/10/2012<br>27/09/2013 |
| | Calibration entity | Nanjing Branch of National Station of Petroleum &Natural Gas Flow Meter | |
| Measuring/ Reading/ Recording frequency: | The monitoring data of the NG consumption was aggregated and recorded daily. | | |
| Calculation method (if applicable): | Meter Reading | | |
| QA/QC procedures: | The total NG consumption was monitored both by Gas supplier and project owner. The monitoring readings were cross-checked with the receipts provided by the gas supply company.<br>All the Gas Flow Meters have been calibrated once a year by a qualified third party. The gas flow meter 1# and 2# are spare to each other. The settlement NG consumption is measured by the meter 1# and 2# together.<br>All the electronic and paper documents will be archived during the crediting period and two years after the end of the crediting period or the last issuance of CERs for this project activity. | | |
| Purpose of data: | Data used for Project Emission calculation. | | |
| Additional comment: | | | |

| Data / Parameter: | $NCV_{NG,y}$ |
|---|---|
| Unit: | $MJ/Nm^3$ |
| Description: | Net Calorific Value of NG |
| Measured/ Calculated / Default: | Weighted average value calculated was applied for emission reduction calculation. |
| Source of data: | Measured by the Petro China Company Ltd using the device of On-line Gas Chromatograph under NTP conditions and the data is provided the Petro China Company Ltd |
| Value(s) of monitored parameter: | 33.5209 |
| Monitoring equipment: | On-line Gas Chromatograph of the Petro China Company Ltd.<br>Type：BTU-8000<br>Serial number: 100839<br>Calibration frequency: every 1yr<br>Last calibration date: 26/05/2011, 22/05/2012,and 20/05/2013<br>Validity: 25/05/2012, 21/05/2013, and 19/05/2014<br>Calibration entity: National Institute of Metrology of P. R. China |
| Measuring/ Reading/ Recording frequency: | The NCV value were measured continuously, read daily, and recorded every ten days. |
| Calculation method (if applicable): | Weighted average value of every ten days NCV values |
| QA/QC procedures: | The value of NCV was measured by the gas chromatography analyzer on-line, which has been record by the Petro China Company Ltd (Gas supplier), and then provided to the project owner.<br>The calibration and testing for on-line gas chromatography analyer was carried out once a year by the qualified measurement technology verification institution authorized by National Institute of Metrology of P.R. China. The calibration results showed that the Gas Chromatograph runs OK.<br>All the electronic and paper documents will be archived during the crediting period and two years after the end of the crediting period or the last issuance of CERs for this project activity. |
| Purpose of data: | Data used for Project Emission calculation. |
| Additional comment: | |

| Data / Parameter: | $OXID_{NG}$ |
|---|---|
| Unit: | None |
| Description: | Oxidation factor of the Natural gas |
| Measured/ Calculated / Default: | Default |
| Source of data: | “2006 IPCC Guidelines for National Greenhouse Gas Inventories” Volume 2 Energy, Chapter 1, Table 1.4, Page 1.24 |
| Value(s) of monitored parameter: | 1.00 for gas |

| | |
|---|---|
| Monitoring equipment: | - |
| Measuring/ Reading/ Recording frequency: | - |
| Calculation method (if applicable): | - |
| QA/QC procedures: | - |
| Purpose of data: | Data used for Project Emission calculation. |
| Additional comment: | |

| **Data / Parameter:** | **$EF_{CO2,NG,y}$** |
|---|---|
| Unit: | $tCO_2/GJ$ |
| Description: | $CO_2$ emission factor per unit of energy of natural gas |
| Measured/ Calculated / Default: | Default |
| Source of data: | Determined by National data which is cited from 2006 IPCC Guidelines for National Greenhouse Gas Inventories" Volume 2 Energy, Chapter I, Table1.4 in Page 1.24. |
| Value(s) of monitored parameter: | 0.0561 |
| Monitoring equipment: | - |
| Measuring/ Reading/ Recording frequency: | - |
| Calculation method (if applicable): | Unit conversion: $EF_{CO2,NG,y}$ = 15.30tC/TJ×44/12/1000 = 0.0561 $tCO_2/GJ$ |
| QA/QC procedures: | During implementing verification period for the project, the latest IPCC-value is applied. |
| Purpose of data: | Data used for $COEF_{NG,y}$, calculation |
| Additional comment: | |

| **Data / Parameter:** | **$COEF_{NG,y,}$** |
|---|---|
| Unit: | $tCO_2/Nm^3$ |
| Description: | $CO_2$ emission coefficient in year y for natural gas |
| Measured/ Calculated / Default: | Calculated |
| Source of data: | Calculated by $COEF_{NG,y} = NCV_{NG,y} * EF_{CO2,NG,y} * OXID_{NG}$ |
| Value(s) of monitored parameter: | See ER Calculation Excel Table |
| Monitoring equipment: | - |
| Measuring/ Reading/ Recording frequency: | - |
| Calculation method (if applicable): | $COEF_{NG,y} = NCV_{NG,y} * EF_{CO2,NG,y} * OXID_{NG}$ |
| QA/QC procedures: | - |
| Purpose of data: | Data used for Project Emission calculation. |
| Additional comment: | |

| **Data / Parameter:** | **$PE_y$** |
|---|---|
| Unit: | $tCO_2e$ |
| Description: | $CO_2$ emissions from the power plant of the project due to combustion of natural gas fuel in y year. |
| Measured/ Calculated / Default: | Calculated |
| Source of data: | Calculated by $PE_y = FC_{NG,y} * COEF_{NG,y}$ |
| Value(s) of monitored parameter: | 1,522,276 |
| Monitoring equipment: | - |
| Measuring/ Reading/ Recording frequency: | - |
| Calculation method (if applicable): | $PE_y = FC_{NG,y} * COEF_{NG,y}$<br>$COEF_{NG,y} = NCV_{NG,y} * EF_{CO2,NG,y} * OXID_{NG}$ |
| QA/QC procedures: | - |
| Purpose of data: | Data used for Project Emission calculation. |
| Additional comment: | |

| **Data / Parameter:** | **$EG_{net,pj,y}$ (Gateway meter No.1 and meter No.3)** |
|---|---|
| Unit: | MWh |
| Description: | The net electricity delivered by the project activity, measured by the meter No.1 and meter No.3. |
| Measured/ Calculated / Default: | Measured |
| Source of data: | Reading at project boundary by electricity meter with bidirectional reading function, and the electricity sell and purchase receipt from the power grid company |
| Value(s) of monitored parameter: | 4,041,292.00 |

| | | | |
|---|---|---|---|
| Monitoring equipment: | Type | Electricity meter No.1 | Electricity meter No.3 |
| | | WU.TE432S | SL7000 |
| | Accuracy class | 0.2s | |
| | Serial number | 18450580 | 33049113 |
| | Calibration frequency | Every 3 months | |
| | Calibration date | 06/10/2011<br>05/01/2012<br>03/04/2012<br>02/07/2012<br>28/09/2012<br>27/12/2012<br>25/03/2013<br>21/06/2013 | 06/10/2011<br>05/01/2012<br>03/04/2012<br>02/07/2012<br>28/09/2012<br>27/12/2012<br>25/03/2013<br>21/06/2013 |
| | Validity | 05/01/2012<br>04/04/2012<br>02/07/2012<br>01/10/2012<br>27/12/2012<br>26/03/2013<br>24/06/2013<br>20/09/2013 | 05/01/2012<br>04/04/2012<br>02/07/2012<br>01/10/2012<br>27/12/2012<br>26/03/2013<br>24/06/2013<br>20/09/2013 |
| | Calibration entity | Testing and Research Institute of Henan Electric Power Research Institute | |
| Measuring/ Reading/ Recording frequency: | Measuring frequency: continuously<br>Recording frequency: daily and monthly record. | | |
| Calculation method (if applicable): | Net electricity supplied is calculated as exported electricity measured by meter No.1 minus imported electricity measured by meter No.1, then minus the imported electricity measured by meter No.3 | | |
| QA/QC procedures: | The electricity output was monitored and recorded at the on-site computer control centre. The record of electricity delivered and the receipt of the electricity purchase was cross-checked by both the project owner and the power grid company.<br>All the electricity meters (meter No.1, meter No.2 and meter No.3) have been calibrated once per three months by a qualified third party.<br>All the electronic and paper documents will be archived during the crediting period and two years after the end of the crediting period or the last issuance of CERs for this project activity. | | |
| Purpose of data: | Data used for Baseline Emission calculation. | | |
| Additional comment: | | | |

| **Data / Parameter:** | **m** |
|---|---|
| Unit: | |
| Description: | A sample group m including recent capacity additions in the CCPG that comprise 20% of the total installed capacity in year 2011 and 2012. |
| Measured/ Calculated / Default: | Default |

| | |
|---|---|
| Source of data: | China's DNA CDM official Website: http://cdm.ccchina.gov.cn/Detail.aspx?newsId=3545&TId=3 http://cdm.ccchina.gov.cn/Detail.aspx?newsId=3553&TId=3 |
| Value(s) of monitored parameter: | See ER Calculation Table |
| Monitoring equipment: | - |
| Measuring/ Reading/ Recording frequency: | - |
| Calculation method (if applicable): | - |
| QA/QC procedures: | According to registered PDD, the latest value available at the DNA website of the crediting year has been used for the calculation. |
| Purpose of data: | Data used for Baseline Emission calculation. |
| Additional comment: | |

| **Data / Parameter:** | **$F_{i,j,y}$** |
|---|---|
| Unit: | t or $Nm^3$ |
| Description: | Fossil fuel i consumption in year y for electricity generation in province j which is covered under CCPG. Used for calculation of $\lambda_i$ and $EF_{BM,y}$ |
| Measured/ Calculated / Default: | Default |
| Source of data: | China's DNA CDM official Website: http://cdm.ccchina.gov.cn/Detail.aspx?newsId=3545&TId=3 http://cdm.ccchina.gov.cn/Detail.aspx?newsId=3553&TId=3 |
| Value(s) of monitored parameter: | See ER Calculation Table |
| Monitoring equipment: | - |
| Measuring/ Reading/ Recording frequency: | - |
| Calculation method (if applicable): | - |
| QA/QC procedures: | According to registered PDD, the latest value available at the DNA website of the crediting year has been used for the calculation. |
| Purpose of data: | Data used for Baseline Emission calculation. |
| Additional comment: | |

| **Data / Parameter:** | **$COEF_{i,j}$** |
|---|---|
| Unit: | $tCO_2/t$ or $Nm_3$ |
| Description: | The $CO_2$ emission factor for fuel type i in Province j, taking into account the carbon content of the fuels used and the percent oxidation of the fuel. Used for calculation of $\lambda_i$ and $EF_{BM,y}$ |
| Measured/ Calculated / Default: | Default |
| Source of data: | China's DNA CDM official Website: http://cdm.ccchina.gov.cn/Detail.aspx?newsId=3545&TId=3 http://cdm.ccchina.gov.cn/Detail.aspx?newsId=3553&TId=3 |
| Value(s) of monitored parameter: | See ER Calculation Table |

| | |
|---|---|
| Monitoring equipment: | - |
| Measuring/ Reading/ Recording frequency: | - |
| Calculation method (if applicable): | - |
| QA/QC procedures: | According to registered PDD, the latest value available at the DNA website of the crediting year has been used for the calculation. |
| Purpose of data: | Data used for Baseline Emission calculation. |
| Additional comment: | |

| **Data / Parameter:** | **$\lambda_{Coal}$, $\lambda_{Oil}$, $\lambda_{Gas}$** |
|---|---|
| Unit: | - |
| Description: | The ratio $\lambda_i$ of the $CO_2$ emissions from solid (coal), liquid (oil) and gas fuels consumed for power generation to the $CO_2$ emissions from total thermal power generation under CCPG. |
| Measured/ Calculated / Default: | Default |
| Source of data: | China's DNA CDM official Website: http://cdm.ccchina.gov.cn/Detail.aspx?newsId=3545&TId=3 |
| Value(s) of monitored parameter: | See ER Calculation Table |
| Monitoring equipment: | - |
| Measuring/ Reading/ Recording frequency: | - |
| Calculation method (if applicable): | - |
| QA/QC procedures: | According to registered PDD, the latest value available at the DNA website of the crediting year has been used for the calculation. |
| Purpose of data: | Data used for Baseline Emission calculation. |
| Additional comment: | |

| **Data / Parameter:** | **$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ , $EF_{Gas,Adv}$** |
|---|---|
| Unit: | $tCO_2/MWh$ |
| Description: | The emission factors in line with the efficiency level of the best technology commercially available in China's power grid for each fuel type as coal, oil and gas respectively. |
| Measured/ Calculated / Default: | Default |
| Source of data: | China's DNA CDM official Website: http://cdm.ccchina.gov.cn/Detail.aspx?newsId=3545&TId=3 |
| Value(s) of monitored parameter: | See ER Calculation Table |
| Monitoring equipment: | - |
| Measuring/ Reading/ Recording frequency: | - |

| | |
|---|---|
| Calculation method (if applicable): | - |
| QA/QC procedures: | According to registered PDD, the latest value available at the DNA website of the crediting year has been used for the calculation. |
| Purpose of data: | Data used for Baseline Emission calculation. |
| Additional comment: | |

| **Data / Parameter:** | **$EF_{Thermal}$** |
|---|---|
| Unit: | $tCO_2/MWh$ |
| Description: | The weighted averaged emission factor $EF_{Thermal}$ of the thermal power capacity under CCPG. |
| Measured/ Calculated / Default: | Default |
| Source of data: | China's DNA CDM official Website: http://cdm.ccchina.gov.cn/Detail.aspx?newsId=3545&TId=3 |
| Value(s) of monitored parameter: | See ER Calculation Table |
| Monitoring equipment: | - |
| Measuring/ Reading/ Recording frequency: | - |
| Calculation method (if applicable): | - |
| QA/QC procedures: | According to registered PDD, the latest value available at the DNA website of the crediting year has been used for the calculation. |
| Purpose of data: | Data used for Baseline Emission calculation. |
| Additional comment: | |

| **Data / Parameter:** | **$CAP_{Total}$** |
|---|---|
| Unit: | MW |
| Description: | The total capacity addition of CCPG in year 2007, 2008, 2009 and 2010. |
| Measured/ Calculated / Default: | Default |
| Source of data: | China's DNA CDM official Website: http://cdm.ccchina.gov.cn/Detail.aspx?newsId=3545&TId=3 |
| Value(s) of monitored parameter: | See ER Calculation Table |
| Monitoring equipment: | - |
| Measuring/ Reading/ Recording frequency: | - |
| Calculation method (if applicable): | - |
| QA/QC procedures: | According to registered PDD, the latest value available at the DNA website of the crediting year has been used for the calculation. |
| Purpose of data: | Data used for Baseline Emission calculation. |
| Additional comment: | |

| Data / Parameter: | $CAP_{Thermal}$ |
|---|---|
| Unit: | MW |
| Description: | The capacity addition by thermal power of CCPG in year 2007, 2008, 2009 and 2010. |
| Measured/ Calculated / Default: | Default |
| Source of data: | China's DNA CDM official Website: http://cdm.ccchina.gov.cn/Detail.aspx?newsId=3545&TId=3 |
| Value(s) of monitored parameter: | See ER Calculation Table |
| Monitoring equipment: | - |
| Measuring/ Reading/ Recording frequency: | - |
| Calculation method (if applicable): | - |
| QA/QC procedures: | According to registered PDD, the latest value available at the DNA website of the crediting year has been used for the calculation. |
| Purpose of data: | Data used for Baseline Emission calculation. |
| Additional comment: | |

| Data / Parameter: | $EF_{grid,BM,y}$ |
|---|---|
| Unit: | $tCO_2e/MWh$ |
| Description: | Build marginal emission factor of the CCPG during the project operation period |
| Measured/ Calculated / Default: | Default |
| Source of data: | China's DNA CDM official Website: http://cdm.ccchina.gov.cn/Detail.aspx?newsId=3545&TId=3 |
| Value(s) of monitored parameter: | See ER Calculation Table |
| Monitoring equipment: | - |
| Measuring/ Reading/ Recording frequency: | - |
| Calculation method (if applicable): | - |
| QA/QC procedures: | According to registered PDD, the latest value available at the DNA website of the crediting year has been used for the calculation. |
| Purpose of data: | Data used for Baseline Emission calculation. |
| Additional comment: | |

## D.3. Implementation of sampling plan

>>

Not applicable.

## SECTION E. Calculation of emission reductions or GHG removals by sinks

### E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>>

Baseline Emissions

According to the registered PDD, Baseline emissions are given as:

$BE_y = EG_{net,pj,y} * EF_{BL,CO2,y}$

Where:

$EG_{net,pj,y}$ : The net electricity delivered by the project activity, measured by the meter No.1 and meter No.3.(MWh).

$EF_{BL,CO2,y}$ : As mentioned in PDD, $EF_{BL,CO2} = \min(EF_{grid,BM,y}, EF_{grid,CM,y}, EF_{BL,CO2,Option3\ EF})$

$EF_{grid,BM,y}$ is selected as the baseline emission factor of CCPG, which is ex-post calculated and updated.

Calculation of $EF_{BL,CO2,y}$ of CCPG in this monitoring period.

Step a: calculate the proportion $\lambda_i$ of the $CO_2$ emissions of solid, liquid and gas fuel type consumed for power generation to the total $CO_2$ emissions from the total thermal power generation.

$$\lambda_{Coal} = \frac{\sum_{i \in coal,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}$$

$$\lambda_{oil} = \frac{\sum_{i \in oil,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}$$

Where:

| | |
|---|---|
| $F_{i,j,y}$ | = the amount of fuel i (in unit t or $Nm^3$) consumed by relevant power sources in provincial grid j in year y; |
| $COEF_{i,j,y}$ | = the $CO_2$ emission coefficient of fuel i ($tCO_2$ /t or $Nm^3$), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y. |

This monitoring period includes 3 civil years （the year of 2011,2012 and 2013）, the value of proportion $\lambda_i$ of the $CO_2$ emissions is deferent. The details are as follow:

| Parameter | Value | Value | Value |
|---|---|---|---|
| Monitoring period | 01/12/2011-31/12/2011 | 01/01/2012-30/06/2013 | 01/01/2012-30/06/2013 |
| $\lambda_{Coal}$ | 97.66% | 93.28% | 93.28% |
| $\lambda_{Oil}$ | 0.13% | 0.31% | 0.10% |
| $\lambda_{Gas}$ | 2.21% | 6.41% | 6.41% |

For the detailed information, please see the 2344 6th CER Calculation Sheet.xls.

Step b: calculate the emission factor $EF_{Thermal}$ of the corresponding thermal power:

According to the formula: $EF_{Thermal} = \lambda_{Coal} \times EF_{CH4,Coal,Adv} + \lambda_{Oil} \times EF_{CH4,Oil,Adv} + \lambda_{Gas} \times EF_{CH4,Gas,Adv}$

For 01/12/2011-31/12/2011: $EF_{Thermal}$ = 0.7870 $tCO_2e/MWh$

For 01/01/2012-31/12/2012: $EF_{Thermal}$ = 0.7651 $tCO_2e/MWh$

For 01/01/2013-30/06/2013: $EF_{Thermal}$ =0.7635 $tCO_2e/MWh$

Step c: calculate the $EF_{grid,BM,y}$ of the grid:

$$EF_{Grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal}$$

Where:

$CAP_{Total}$ is the total new capacity addition (MW),

$CAP_{Thermal}$ is the new capacity addition of thermal power plants (MW).

The share of thermal power of recent capacity addition is 53.25% (See 2344 6th CER Calculation Sheet.xls for details), thus, the

Build Margin emission factor ($EF_{grid,BM,y}$) of this monitoring period is calculated as:

$$EF_{Grid,BM,2011} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} = 53.25\% \times 0.7870 = 0.4191 tCO_2e / MWh$$

$$EF_{Grid,BM,2012} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} = 61.85\% \times 0.7651 = 0.4733\, tCO_2e / MWh$$

$$EF_{Grid,BM,2013} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} = 65.36\% \times 0.7635 = 0.4990\, tCO_2e / MWh$$

Thus, $BE_y$ is calculated as:

| Period | EG (From Project to Grid) | EG (From Grid to Project) | $EG_{net,pj,y}$ | $EG_{net,pj,\ 201x}$ |
|---|---|---|---|---|
| Unit | MWh | MWh | MWh | MWh |
| 01/12/2011-31/12/2011 | 410,575.5 | 13.794 | 410,561.706 | 410,561.706 |
| 01/01/2012-31/01/2012 | 318,165.75 | 294.888 | 317,870.862 | 2,544,831.27 |
| 01/02/2012-29/02/2012 | 188,583 | 398.016 | 188,184.984 | |
| 01/03/2012-31/03/2012 | 196,633.5 | 386.178 | 196,247.322 | |
| 01/04/2012-30/04/2012 | 181,792.5 | 393.132 | 181,399.368 | |
| 01/05/2012-31/05/2012 | 250,080.75 | 143.55 | 249,937.2 | |
| 01/06/2012-30/06/2012 | 364,006.5 | 270.936 | 363,735.564 | |
| 01/07/2012-31/07/2012 | 295,206.75 | 404.976 | 294,801.774 | |
| 01/08/2012-31/08/2012 | 190,548 | 599.526 | 189,948.474 | |
| 01/09/2012-30/09/2012 | 148,752 | 660.9 | 148,091.1 | |
| 01/10/2012-31/10/2012 | 162,682.5 | 589.68 | 162,092.82 | |
| 01/11/2012-30/11/2012 | 218,100.75 | 574.134 | 217,526.616 | |
| 01/12/2012-31/12/2012 | 35,820.75 | 825.564 | 34,995.186 | |
| 01/01/2013-31/01/2013 | 21,245.25 | 606.804 | 20,638.446 | 1,085,899.03 |
| 01/02/2013-28/02/2013 | 199,740 | 550.5 | 199,189.5 | |
| 01/03/2013-31/03/2013 | 222,962.25 | 389.166 | 222,573.084 | |
| 01/04/2013-30/04/2013 | 199,950.75 | 132.642 | 199,818.108 | |
| 01/05/2013-31/05/2013 | 197,859.75 | 324.714 | 197,535.036 | |
| 01/06/2013-30/06/2013 | 246,277.5 | 132.648 | 246,144.852 | |
| Sum | 4,048,983.75 | 7,691.748 | 4,041,292.002 | |

$BE_{2011}$ = $EG_{net,pj,\ 2011}$ * $EF_{BL,\ CO2,\ 2011}$ = $EG_{net,pj,\ 2011}$* $EF_{grid,BM,2011}$= 410,561.71MWh * 0.4191 $tCO_2e/MWh$ = 172,066.41 ($tCO_2e$)

$BE_{2012}$ = $EG_{net,pj,2012}$* $EF_{BL,CO2,2012}$ = $EG_{net,pj,2012}$* $EF_{grid,BM,2012}$= 2,544,831.27MWh * 0.4733 $tCO_2e/MWh$ = 1,204,468.64 ($tCO_2e$).

$BE_{2013}$ = $EG_{net,pj,\ 2013}$ * $EF_{BL,\ CO2,\ 2013}$ = $EG_{net,pj,\ 2013}$* $EF_{grid,BM,2013}$= 1,085,899.03MWh * 0.4990 $tCO_2e/MWh$ = 541,863.61 ($tCO_2e$).

**$BE = BE_{2011} + BE_{2012} + BE_{2013} = 1,918,399\ (tCO_2e)$**

## E.2. Calculation of project emissions or actual net GHG removals by sinks

>>

Project Emissions

According to section 6.1 of the registered PDD, Project Emissions are given as:

$PE_y = FC_{NG,y} * COEF_{NG,y}$

Where

$FC_{NG,y}$: the total volume of NG combusted ($Nm^3$) during this monitoring period. The monitored data is listed in Annex 1 of this monitoring report.

$COEF_{NG,y}$: the $CO_2$ emission coefficient ($tCO_2/Nm^3$) during this monitoring period for NG, which is calculated as follows:

$COEF_{NG,y} = NCV_{NG,y} * EF_{CO2,NG,y} * OXID_{NG}$

Where:

$NCV_{NG,y}$ : the net calorific value (energy content) per volume unit of NG during this monitoring period ($GJ/Nm^3$) as provided by the fuel supplier.

$EF_{CO2,NG,y}$ : the $CO_2$ emission factor per unit of energy value of NG in this monitoring period . It was determined by national data which is cited from the updated edition of IPCC 2006, page 24 according to the registered PDD. The $EF_{CO2,NG,y}$ is $0.0561tCO_2e/GJ$

$OXID_{NG}$ : the IPCC default value 100% is used according to the registered PDD.

The every month's weighted averaged $NCV_{NG,y}$ value of this monitoring period are listed as follow:

| Period | 01/12/2011 - 31/12/2011 | 01/01/2012-31/01/2012 | 01/02/2012 - 29/02/2012 | 01/03/2012 - 31/03/2012 | 01/04/2012-30/04/2012 | 01/05/2012 - 31/05/2012 |
|---|---|---|---|---|---|---|
| $NCV_{NG,y}$ ($MJ/Nm^3$) | 33.80 | 33.68 | 33.72 | 33.56 | 33.29 | 33.25 |
| Period | 01/06/2012 - 30/06/2012 | 01/07/2012-31/07/2012 | 01/08/2012 - 31/08/2012 | 01/09/2012 - 30/09/2012 | 01/10/2012-31/10/2012 | 01/11/2012 - 30/11/2012 |
| $NCV_{NG,y}$ ($MJ/Nm^3$) | 33.32 | 33.32 | 33.34 | 33.34 | 33.37 | 33.36 |
| Period | 01/12/2012 - 31/12/2012 | 01/01/2013-31/01/2013 | 01/02/2013 - 28/02/2013 | 01/03/2013 - 31/03/2013 | 01/04/2013-30/04/2013 | 01/05/2013 - 31/05/2013 |
| $NCV_{NG,y}$ ($MJ/Nm^3$) | 33.40 | 33.54 | 33.48 | 33.80 | 33.39 | 33.55 |
| Period | 01/06/2013 - 30/06/2013 | | | | | |
| $NCV_{NG,y}$ ($MJ/Nm^3$) | 34.03 | | | | | |

For the every month's Project Emission and the total Project Emission during this monitoring period, please refer to the table below.

| Period | $NCV_{NG,y}$ | $EF_{CO2,NG,Y}$ | $OXID_{NG}$ | $COEF_{NG,y}$ | $PE_y = FC_{NG,y} * COEF_{NG,y}$ |
|---|---|---|---|---|---|
| | $MJ/Nm^3$ | $tCO_2e/GJ$ | | $tCO_2/Nm^3$ | $tCO_2e$ |

| | | | | | |
|---|---|---|---|---|---|
| 01/12/2011-31/12/2011 | 33.80 | 0.0561 | 1 | 0.00190 | 155,785 |
| 01/01/2012-31/01/2012 | 33.68 | 0.0561 | 1 | 0.00189 | 118,969 |
| 01/02/2012-29/02/2012 | 33.72 | 0.0561 | 1 | 0.00189 | 72,705 |
| 01/03/2012-31/03/2012 | 33.56 | 0.0561 | 1 | 0.00188 | 73,821 |
| 01/04/2012-30/04/2012 | 33.29 | 0.0561 | 1 | 0.00187 | 69,676 |
| 01/05/2012-31/05/2012 | 33.25 | 0.0561 | 1 | 0.00187 | 89,596 |
| 01/06/2012-30/06/2012 | 33.32 | 0.0561 | 1 | 0.00187 | 135,053 |
| 01/07/2012-31/07/2012 | 33.32 | 0.0561 | 1 | 0.00187 | 112,777 |
| 01/08/2012-31/08/2012 | 33.34 | 0.0561 | 1 | 0.00187 | 72,179 |
| 01/09/2012-30/09/2012 | 33.34 | 0.0561 | 1 | 0.00187 | 56,249 |
| 01/10/2012-31/10/2012 | 33.37 | 0.0561 | 1 | 0.00187 | 59,082 |
| 01/11/2012-30/11/2012 | 33.36 | 0.0561 | 1 | 0.00187 | 82,747 |
| 01/12/2012-31/12/2012 | 33.40 | 0.0561 | 1 | 0.00187 | 14,232 |
| 01/01/2013-31/01/2013 | 33.54 | 0.0561 | 1 | 0.00188 | 7,582 |
| 01/02/2013-28/02/2013 | 33.48 | 0.0561 | 1 | 0.00188 | 74,864 |
| 01/03/2013-31/03/2013 | 33.80 | 0.0561 | 1 | 0.00190 | 85,964 |
| 01/04/2013-30/04/2013 | 33.39 | 0.0561 | 1 | 0.00187 | 71,836 |
| 01/05/2013-31/05/2013 | 33.55 | 0.0561 | 1 | 0.00188 | 75,745 |
| 01/06/2013-30/06/2013 | 34.03 | 0.0561 | 1 | 0.00191 | 93,416 |
| Total | | | | | 1,522,276 |

## E.3. Calculation of leakage

>>

As mentioned in PDD, Leakage may result from upstream processes of fossil fuels outside of the project boundary. This includes mainly fugitive $CH_4$ emissions and $CO_2$ emissions from associated fuel combustion and flaring. In line with AM0029 version 03, as no LNG is used in the project plant, only leakage emissions from using natural gas ($LE_{CH4,y}$) are considered, which can be calculated based on following steps as mentioned in the PDD:

Step$_{CH4}$ a): calculate the weight proportion $\lambda_{k,CH4}$ which is defined as the ratio of the upstream $CH_4$ emissions associated with solid, liquid and gas fuel type consumed for power generation respectively to the total upstream $CH_4$ emissions for the total thermal power generation in the grid.

$$\lambda_{Coal,CH4} = \frac{\sum_{k \in coal,j} F_{k,j,y} \times COEF_{k,j,CH4}}{\sum_{k,j} F_{k,j,y} \times COEF_{k,j,CH4}}$$

$$\lambda_{Oil,CH4} = \frac{\sum_{k \in Oil,j} F_{k,j,y} \times COEF_{k,j,CH4}}{\sum_{k,j} F_{k,j,y} \times COEF_{k,j,CH4}}$$

$$\lambda_{GAS,CH4} = \frac{\sum_{k \in GAS,j} F_{k,j,y} \times COEF_{k,j,CH4}}{\sum_{k,j} F_{k,j,y} \times COEF_{k,j,CH4}}$$

where:

$F_{k,j,y}$: the amount of k type fuel (in unit t or $Nm^3$) consumed by relevant electric power sources in provincial grid j in year y,

$COEF_{k,j,CH4}$: the upstream fugitive $CH_4$ emission coefficient of k type fuel ($tCH_4/TJ$) used by relevant power sources in provincial grid j.

This monitoring period includes 3 civil years （the year of 2011,2012 and 2013）, the values of $\lambda_{Coal/oil/gas,CH4}$ and the Fugitive Methane Emission Factor of the Fuel ($EF_{coal/oil/gas,Adv,CH4}$) is different. The details are as follow:

<1> For **01/12/2011-31/12/2011** monitoring period, $\lambda_{Coal,CH4}$ =97.37%, $\lambda_{Oil,CH4}$ =0.00%, $\lambda_{Gas,CH4}$ =2.62%.

$Step_{CH4}$ b: calculate the weighted averaged upstream fugitive $CH_4$ emission factor for the thermal electric power ($tCH_4/MWh$), $EF_{Thermal,Upstream,CH4}$:

$EF_{Thermal,Upstream,CH4} = \lambda_{Coal,CH4} * EF_{Coal,Adv,CH4} + \lambda_{Oil,CH4} * EF_{Oil,Adv,CH4} + \lambda_{Gas,CH4} * EF_{Gas,Adv,CH4}$

Where:

$EF_{Coal,Adv,CH4}$, $EF_{Oil,Adv,CH4}$ and $EF_{Gas,Adv,CH4}$ are the upstream fugitive $CH_4$ emission factors in line with the efficiency level of the best power technology commercially available ($tCO_2/MWh$) in China's power grid for each fuel type respectively.

The $EF_{Coal,Adv,CH4}$, $EF_{Oil,Adv,CH4}$ and $EF_{Gas,Adv,CH4}$ value for this monitoring period are listed as follow:

| Type of Power Plant | Variable | Oxidation | Efficiency of Power Supply | Fugitive Methane Emission Factor of the Fuel ($tCH_4/TJ$) | Fugitive Methane Emission Factor ($tCO_2/MWh$) |
|---|---|---|---|---|---|
| Coal-Fired Power Plant | $EF_{Coal,Adv,CH4}$ | 1 | 39.45% | 0.6462 | 0.0059 |
| Oil-Fired Power Plant | $EF_{Oil,Adv,CH4}$ | 1 | 51.77% | 0.0041 | 0.0000 |
| Gas-Fired Power Plant | $EF_{Gas,Adv,CH4}$ | 1 | 51.77% | 0.2960 | 0.0021 |

So, $EF_{Thermal,\ Upstream,CH4}$=97.37%×0.0059+0.00%×0.0000 +2.62%×0.0021=0.00579576 $tCH_4/MWh$

$Step_{CH4}$ c: Calculate the $EF_{BL,upstream,CH4}$ in the context of CCPG grid BM ($tCH_4/MWh$):

$$EF_{BL,Upstream,CH4} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal,Upstream,CH4}$$

Here $CAP_{Total}$ is the total recent capacity addition (MW); $CAP_{Thermal}$ is the recent capacity addition of thermal power plants within the CCPG grid BM sample group m (MW).

For this monitoring period,

$EF_{BL,upstream,CH4}$ = 53.25%×0.00579576 $tCH_4/MWh$ =0.003086 $tCH_4/MWh$

To estimate the fugitive methane emissions, one can multiply the NG quantity consumed by the project in year y with an emission factor for fugitive $CH_4$ emissions ($EF_{NG,upstream,CH4}$) due to NG consumption and subtract the fugitive $CH_4$ emissions occurring from fossil fuels used in the selected baseline power plant in the absence of the project activity, as follows:

$$LE_{CH4,y} = \left[ FC_y \times NCV_{NG,y} \times EF_{NG,upstream,CH4} - EG_{PJ,y} \times EF_{BL,upstream,CH4} \right] \times GWP_{CH4}$$

Where:

$LE_{CH4,y}$: Leakage emissions due to fugitive upstream $CH_4$ emissions in the year y in $tCO_2e$.

$FC_y$: Total volume of NG combusted ($Nm^3$) during this monitoring period.

$NCV_{NG,y}$: Net calorific value of NG (GJ/ $Nm^3$), which is determined by the fuel supplier.

$EF_{NG,upstream,CH4}$: Emission factor for upstream fugitive methane emissions of natural gas from production, transportation, distribution, in $tCH^4$/ GJ.

$EG_{PJ,y}$: Electricity generation in the project plant during this monitoring period in MWh.

$EF_{BL,upstream,CH4}$: The emission factor determined in $step_{CH4}$ c above for upstream fugitive methane emission occurring in the absence of the project activity in $tCH_4$/MWh.

$GWP_{CH4}$： Global warming potential of methane valid for the relevant commitment period, and the value is 21 $tCO_2e/tCH_4$.

The $EF_{NG,upstream,CH4}$, $EF_{BL,upstream,CH4}$, and $GWP_{CH4}$ values for calculation the parameter $LE_{CH4,y}$ in this monitoring period are listed as follow:

$EF_{NG,upstream,CH4}$ = 0.000296 $tCH_4$/ GJ

$EF_{BL,upstream,CH4}$ = 0.00309 $tCH_4$/MWh

$GWP_{CH4}$ = 21 $tCO_2e/tCH_4$

For this monitoring period, $LE_{CH4,y}$= -9,520.14($tCO_2e$), which is a negative value.

<2> For **01/01/2012-31/12/2012** monitoring period, $\lambda_{Coal,CH4}$ =96.76%, $\lambda_{Oil,CH4}$ =0.00%, $\lambda_{Gas,CH4}$ =3.24%.

$Step_{CH4}$ b: calculate the weighted averaged upstream fugitive $CH_4$ emission factor for the thermal electric power ($tCH_4$/MWh), $EF_{Thermal,Upstream,CH4}$:

$EF_{Thermal,Upstream,CH4} = \lambda_{Coal,CH4} * EF_{Coal,Adv,CH4} + \lambda_{Oil,CH4} * EF_{Oil,Adv,CH4} + \lambda_{Gas,CH4} * EF_{Gas,Adv,CH4}$

Where:

$EF_{Coal,Adv,CH4}$, $EF_{Oil,Adv,CH4}$ and $EF_{Gas,Adv,CH4}$ are the upstream fugitive $CH_4$ emission factors in line with the efficiency level of the best power technology commercially available ($tCO_2$/MWh) in China's power grid for each fuel type respectively.

The $EF_{Coal,Adv,CH4}$, $EF_{Oil,Adv,CH4}$ and $EF_{Gas,Adv,CH4}$ value for this monitoring period are listed as follow:

| Type of Power Plant | Variable | Oxidation | Efficiency of Power Supply | Fugitive Methane Emission Factor of the Fuel ($tCH_4$/TJ) | Fugitive Methane Emission Factor ($tCO_2$/MWh) |
|---|---|---|---|---|---|
| Coal-Fired Power Plant | $EF_{Coal,Adv,CH4}$ | 1 | 39.65% | 0.6564 | 0.0060 |
| Oil-Fired Power Plant | $EF_{Oil,Adv,CH4}$ | 1 | 51.93% | 0.0041 | 0.0000 |
| Gas-Fired Power Plant | $EF_{Gas,Adv,CH4}$ | 1 | 51.93% | 0.2960 | 0.0021 |

So, $EF_{Thermal,\ Upstream,CH4}$=96.76%×0.0060+0.00%×0.0000 +3.24%×0.0021=0.00583265 $tCH_4$/MWh

$Step_{CH4}$ c: Calculate the $EF_{BL,upstream,CH4}$ in the context of CCPG grid BM ($tCH_4$/MWh):

$$EF_{BL,Upstream,CH4} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal,Upstream,CH4}$$

Here $CAP_{Total}$ is the total recent capacity addition (MW); $CAP_{Thermal}$ is the recent capacity addition of thermal power plants within the CCPG grid BM sample group m (MW).

For this monitoring period,

$EF_{BL,upstream,CH4}$ = 61.85%×0.00583265 $tCH_4$/MWh =0.00361 $tCH_4$/MWh

To estimate the fugitive methane emissions, one can multiply the NG quantity consumed by the project in year y with an emission factor for fugitive $CH_4$ emissions ($EF_{NG,upstream,CH4}$) due to NG consumption and subtract the fugitive $CH_4$ emissions occurring from fossil fuels used in the selected baseline power plant in the absence of the project activity, as follows:

$$LE_{CH4,y} = \left[ FC_y \times NCV_{NG,y} \times EF_{NG,upstream,CH4} - EG_{PJ,y} \times EF_{BL,upstream,CH4} \right] \times GWP_{CH4}$$

Where:

$LE_{CH4,y}$: Leakage emissions due to fugitive upstream $CH_4$ emissions in the year y in $tCO_2e$.

$FC_y$: Total volume of NG combusted ($Nm^3$) during this monitoring period.

$NCV_{NG,y}$: Net calorific value of NG (GJ/ $Nm^3$), which is determined by the fuel supplier.

$EF_{NG,upstream,CH4}$: Emission factor for upstream fugitive methane emissions of natural gas from production, transportation, distribution, in $tCH^4$/ GJ.

$EG_{PJ,y}$: Electricity generation in the project plant during this monitoring period in MWh.

$EF_{BL,upstream,CH4}$: The emission factor determined in $step_{CH4}$ c above for upstream fugitive methane emission occurring in the absence of the project activity in $tCH_4$/MWh.

$GWP_{CH4}$： Global warming potential of methane valid for the relevant commitment period, and the value is 21 $tCO_2e/tCH_4$.

The $EF_{NG,upstream,CH4}$, $EF_{BL,upstream,CH4}$, and $GWP_{CH4}$ values for calculation the parameter $LE_{CH4,y}$ in this monitoring period are listed as follow:

$EF_{NG,upstream,CH4}$ = 0.000296 $tCH_4$/ GJ

$EF_{BL,upstream,CH4}$ = 0.00361 $tCH_4$/MWh

$GWP_{CH4}$ = 21 $tCO_2e/tCH_4$

For this monitoring period, $LE_{CH4,y}$= - 86,535.73($tCO_2e$), which is a negative value.

<3> For **01/01/2013-30/06/2013** monitoring period, $\lambda_{Coal,CH4}$ =96.93%, $\lambda_{Oil,CH4}$ =0.00%, $\lambda_{Gas,CH4}$ =3.07%.

$Step_{CH4}$ b: calculate the weighted averaged upstream fugitive $CH_4$ emission factor for the thermal electric power ($tCH_4$/MWh), $EF_{Thermal,Upstream,CH4}$:

$EF_{Thermal,Upstream,CH4} = \lambda_{Coal,CH4} * EF_{Coal,Adv,CH4} + \lambda_{Oil,CH4} * EF_{Oil,Adv,CH4} + \lambda_{Gas,CH4} * EF_{Gas,Adv,CH4}$

Where:

$EF_{Coal,Adv,CH4}$, $EF_{Oil,Adv,CH4}$ and $EF_{Gas,Adv,CH4}$ are the upstream fugitive $CH_4$ emission factors in line with the efficiency level of the best power technology commercially available ($tCO_2$/MWh) in China's power grid for each fuel type respectively.

The $EF_{Coal,Adv,CH4}$, $EF_{Oil,Adv,CH4}$ and $EF_{Gas,Adv,CH4}$ value for this monitoring period are listed as follow:

| Type of Power Plant | Variable | Oxidation | Efficiency of Power Supply | Fugitive Methane Emission Factor of the Fuel ($tCH_4$/TJ) | Fugitive Methane Emission Factor ($tCO_2$/MWh) |
|---|---|---|---|---|---|
| Coal-Fired Power Plant | $EF_{Coal,Adv,CH4}$ | 1 | 39.84% | 0.6568 | 0.0059 |
| Oil-Fired Power Plant | $EF_{Oil,Adv,CH4}$ | 1 | 52.50% | 0.0041 | 0.0000 |
| Gas-Fired Power Plant | $EF_{Gas,Adv,CH4}$ | 1 | 52.50% | 0.2960 | 0.0020 |

So, $EF_{Thermal,\ Upstream,CH4}$=96.93%×0.0059+0.00%×0.0000 +3.07%×0.0020=0.00581466 $tCH_4$/MWh

$Step_{CH4}$ c: Calculate the $EF_{BL,upstream,CH4}$ in the context of CCPG grid BM ($tCH_4$/MWh):

$$EF_{BL,Upstream,CH4} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal,Upstream,CH4}$$

Here $CAP_{Total}$ is the total recent capacity addition (MW); $CAP_{Thermal}$ is the recent capacity addition of thermal power plants within the CCPG grid BM sample group m (MW).

For this monitoring period,

$EF_{BL,upstream,CH4}$ = 65.36%×0.00581466 $tCH_4$/MWh =0.00380 $tCH_4$/MWh

To estimate the fugitive methane emissions, one can multiply the NG quantity consumed by the project in year y with an emission factor for fugitive $CH_4$ emissions ($EF_{NG,upstream,CH4}$) due to NG consumption and subtract the fugitive $CH_4$ emissions occurring from fossil fuels used in the selected baseline power plant in the absence of the project activity, as follows:

$$LE_{CH4,y} = \left[FC_y \times NCV_{NG,y} \times EF_{NG,upstream,CH4} - EG_{PJ,y} \times EF_{BL,upstream,CH4}\right] \times GWP_{CH4}$$

Where:

$LE_{CH4,y}$: Leakage emissions due to fugitive upstream $CH_4$ emissions in the year y in $tCO_2e$.

$FC_y$: Total volume of NG combusted ($Nm^3$) during this monitoring period.

$NCV_{NG,y}$: Net calorific value of NG (GJ/ $Nm^3$), which is determined by the fuel supplier.

$EF_{NG,upstream,CH4}$: Emission factor for upstream fugitive methane emissions of natural gas from production, transportation, distribution, in $tCH^4$/ GJ.

$EG_{PJ,y}$: Electricity generation in the project plant during this monitoring period in MWh.

$EF_{BL,upstream,CH4}$: The emission factor determined in $step_{CH4}$ c above for upstream fugitive methane emission occurring in the absence of the project activity in $tCH_4$/MWh.

$GWP_{CH4}$： Global warming potential of methane valid for the relevant commitment period, and the value is 25 $tCO_2e/tCH_4$.

The $EF_{NG,upstream,CH4}$, $EF_{BL,upstream,CH4}$, and $GWP_{CH4}$ values for calculation the parameter $LE_{CH4,y}$ in this monitoring period are listed as follow:

$EF_{NG,upstream,CH4}$ = 0.000296 $tCH_4$/ GJ

$EF_{BL,upstream,CH4}$ = 0.00380 $tCH_4$/MWh

$GWP_{CH4}$ = 25 $tCO_2e/tCH_4$

For this monitoring period, $LE_{CH4,y}$= -49,395.75 ($tCO_2e$), which is a negative value.

According to AM0029 version 3, the value of leakage is assumed as 0, i.e., **$LE_y$ = 0.**

### E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

| Item | Baseline emissions or baseline net GHG removals by sinks (t $CO_2e$) | Project emissions or actual net GHG removals by sinks (t $CO_2e$) | Leakage (t $CO_2e$) | Emission reductions or net anthropogenic GHG removals by sinks (t $CO_2e$) |
|---|---|---|---|---|
| **Total** | 1,918,399 | 1,522,276 | 0 | 396,122 |

### E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

| Item | Values estimated in ex-ante calculation of registered PDD | Actual values achieved during this monitoring period |
|---|---|---|
| Emission reductions or GHG removals by sinks (t $CO_2e$) | 1,358,957 | 396,122 |

### E.6. Remarks on difference from estimated value in registered PDD

>>

During this monitoring period, the project is in the normal production as usual. However, the emission reduction during this monitoring period is lower than estimated in the PDD. The main reason is the value change of $EF_{grid,BM,y}$ which is used to calculated baseline emission. The value of $EF_{grid,BM,y}$ is ex-post determined, in this monitoring period the value of $EF_{grid,BM,y}$ is 0.4191, 0.4733 and 0.4990 $tCO_2e/MWh$ for the years of 2011, 2012 and 2013, which is much lower than the value in the registered PDD (0.7156 $tCO_2e/MWh$).

## E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

| Item | Actual values achieved up to 31 December 2012 | Actual values achieved from 1 January 2013 onwards |
|---|---|---|
| **Emission reductions or GHG removals by sinks (t $CO_2e$)** | 263,665 | 132,457 |

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# Appendix 1. Contact information of project participants and responsible persons/ entities

| | |
|---|---|
| **Project participant and/or responsible person/ entity** | ☐ Project participant |
| **Organization name** | Henan Zhongyuan Gas Power Company Ltd. |
| **Street/P.O. Box** | No. 68, Jiefang Road |
| **Building** | Zhongyuan Building |
| **City** | Zhumadian |
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| **Contact person** | Chen Zhiqiang |
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| | |
|---|---|
| **Project participant and/or responsible person/ entity** | ☐ Project participant |
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| **Contact person** | von Zweigbergk |
| **Title** | President & CEO |
| **Salutation** | Mr |

| | |
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| **Last name** | von Zweigbergk |
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| | |
|---|---|
| **Project participant and/or responsible person/ entity** | ☐ Responsible person/ entity for completing the CDM-MR-FORM |
| **Organization name** | Beijing MD Energy Technology Co. Ltd. |
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## Document information

| *Version* | *Date* | *Description* |
|---|---|---|
| 04.0 | 25 June 2014 | Revisions to:<br>• Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0));<br>• Include provisions related to standardized baselines;<br>• Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1;<br>• Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*;<br>• Editorial improvement. |
| 03.2 | 5 November 2013 | Editorial revision to correct table in page 1. |
| 03.1 | 2 January 2013 | Editorial revision to correct table in section E.5. |
| 03.0 | 3 December 2012 | Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11). |
| 02.0 | 13 March 2012 | Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20). |
| 01 | 28 May 2010 | EB 54, Annex 34. Initial adoption. |

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