CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

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Energy Efficiency through a Coke Oven Automatic Combustion Control System at the Shanxi Sunlight Coking Group Holding Co., Ltd., China

Version 1

January 31, 2011

A.2. Description of the small-scale project activity:

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The purpose of the project activity is to achieve energy efficiency improvement at the coking plant of the Shanxi Sunlight (Yangguang) Coking Group Holding Co., Ltd. (hereinafter referred as "Yangguang"), located in Shanxi province of China. The proposed project activity is to generate electric power using recovered coke oven gas (hereinafter referred as "COG") from reduced heat consumption in coke oven, and the generated electricity will be sold to the grid electricity system, therefore GHG emissions can be reduced. The heat consumption reduction in the coke oven is to be achieved by applying the Automatic Combustion Control System (hereinafter referred as "ACCS"). The ACCS is a computer-aided coking control and management system, and the basic concept is to reduce and minimize heat consumption during coking in coke oven chambers. The technology, developed by Mitsubishi Chemical Engineering Corporation, is transferred from Japan.

Yangguang was established in 1992 with a capital of 1.5 million Yuan, and is located in Hejin City, Shanxi Province of People's Republic of China. Annuall (nominal) coke production is 3 million tons, and also producing chemicals from coking residue. The actual annual coke production in 2010 is 2.35 million tons. The plant has 6 coke ovens and ACCSs are planned to be introduced in four ovens among them. Utilizing ACCS, the proposed project can save around 7% of COG which would have been consumed in the coke oven, and can utilize the saved COG to produce electricity. The estimated annual emission reduction is 14,829 tons of CO_2.

The project activity will contribute to the sustainable development of Shanxi and China. In 1980, the energy consumption in China was only 419 million toe, however it has been increased year by year, and in 2010, it is estimated to reach up to 1,919 million toe. In regard to coke production, it was 122 million tons in 2000, and had been increasing rapidly up to 324 million tons in 2008. Around 25% of coke is produced in Shanxi province. It is mentioned that the coke industry in China has not been so much efficient therefore emitting large amount of CO_2 and local air pollutants.
Under these circumstances, the proposed CDM will promote savings of energy and GHG emissions at a coke plant through introducing state-of-art technology of Japan. Showing the successful and best practice to realize energy efficiency and GHG saving utilizing the CDM, ripple effects can be expected not only to the plant but also to Shanxi province and the coke industry in China.

A.3. Project participants:

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Name of party involved	Private and/or public entity(ies) Project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
China (host)	Private entity: Shanxi Sunlight Coking Group Holding Co., Ltd. (Yangguang)	No
Japan	Public entity: New Energy and Industrial Technology Development Organization (NEDO)	No

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

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A.4.1.1. Host Party(ies):

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People's Republic of China

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

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Shanxi Province

A.4.1.3. City/Town/Community etc:

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Hejin City

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

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Shanxi Sunlight Coking Group Holding Co., Ltd. (Yangguang) is located in Hejin City, near the south-western border of Shanxi Province and alongside of Huang-He River (the Yellow River) and Fen-He River. The site coordinates are N35°39'16",, E110°38'59",. The site provides an easy access for gathering coal from mainly southern part of Shanxi Province and deliver coke product to the users by railways and highways. The project site is located in the Yangguang coking industrial park.

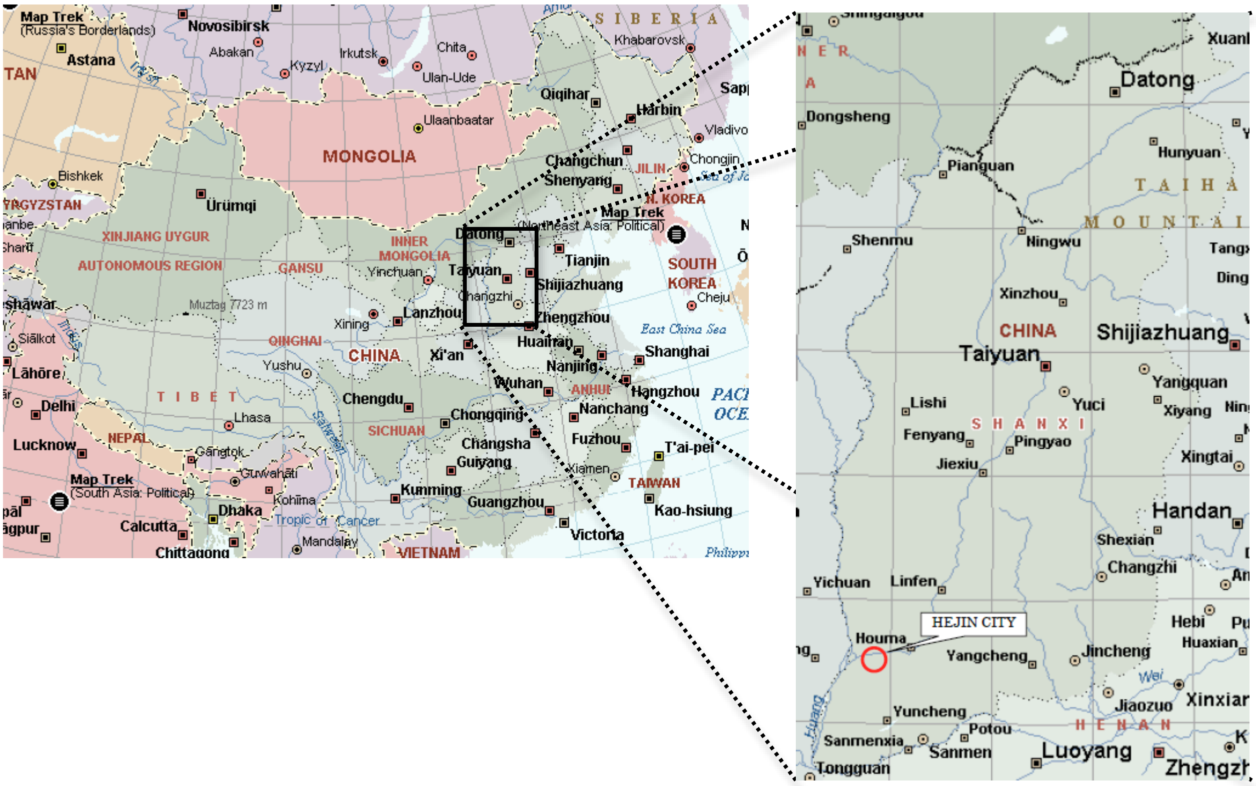

Figure 1 Physical location of the project activity

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

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Type II project activity, energy efficiency project activity, which reduces energy consumption on the demand side. Category: I. Efficient utilization of waste energy in industrial facilities.

Generally, coke is used in blast furnace in steel making industries and also used in various industries and household as a heat source. When coal is carbonized in coke oven, coke oven gas (raw COG) is generated , and raw COG is sent to COG purification unit and purified into purified COG. Almost half of purified COG is sent to coke oven as heat source for coal carbonization. Another half of purified COG is sent to various COG users, inside and/or outside of the firm.

In China coke oven operation is performed in accordance with operation manuals and guidance prepared by coke oven design firm. Such manuals instruct enough coking time in which every batch of coke could get heat transfer for product quality. Actually every coke chamber has its characteristic and coking time differ each other. Chinese operation method, which target the longest coking time, leads over input of heat by more 5% than required.

The ACCS system will detect temperature profile of individual coke oven using thermocouples specially designed and prepared which are installed in COG exit line and coke oven ceiling. The system could indicate proper pushing out time or heating temperature chamber by chamber, and eventually conclude saving COG. Thus COG conservation, and CO2 reduction could be developed.

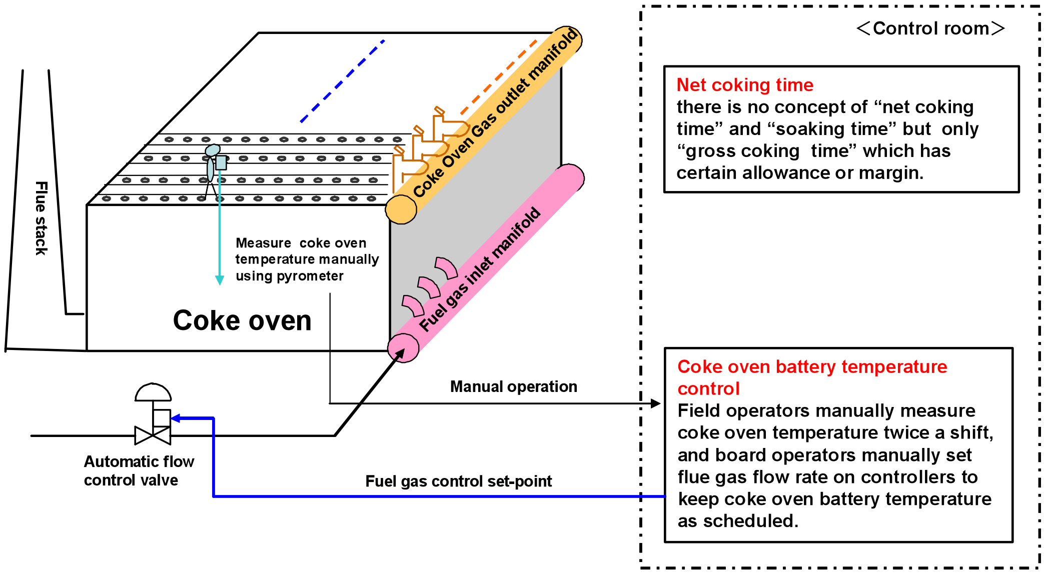
The ACCS is basically a computer-aided coking control and management system. Fundamental concept is to reduce and minimize heat consumption during coking in coke oven chambers.
Most of coking industries except small number of advanced ones do not have any concept of “net coking time (net carbonization time)” and “soaking time”. They heat raw material, that is coal, in order to meet and satisfy their product quality criteria, eventually to heat coal excessively. There exist potential opportunity to save considerable amount of energy. Herein, for reference, “net coking time” means time when raw coal change into coke thoroughly, while “soaking time” means time necessary for coke itself to increase mechanical strength and to shrink in volume to be easily pushed out from oven chamber by pusher. Holding time is known among the advanced coking industries through long experience.
There are two options to save energy:
1. To shorten and minimize soaking time ; and
2. To lower coking temperature during same total coking time
The second option is preferable from the viewpoint of maintenance, whereas coke oven chamber will enjoy longer lifetime in comparatively lower temperature.

The system consists of:
- Computer and DCS (Distributed Control System) hardware; and
- Computer software; and
- Thermometers (thermocouples which are specially designed to endure in high-temperature circumstances) ; and
- Cable, wire and Compensation lead wire; and
- Fuel gas calorie meter; and
- Flue gas O_2 meter; and
- Field works to fix above mentioned facilities and equipment.

The system is able to cast prediction of adequate pushing-out timing of coke product depending on each oven chamber’s individualistic parameter. The prediction is depending on the temperature profile of exhaust gas (raw COG) from coke oven chamber to exhaust gas manifold. The temperature will change in accordance with gas composition change during coking process.
Yangguang’s coking process without such methodology as ACCS results in 5% unnecessary and excess coking time from that of controlled. It concludes that ACCS could recover 5% of COG from that used for fuel of coking.

The main scheme of the ACCS system shows below;

Before Automatic Combustion Control System introduced (Conceptual outline)



After Automatic Combustion Control System introduced (Conceptual outline)

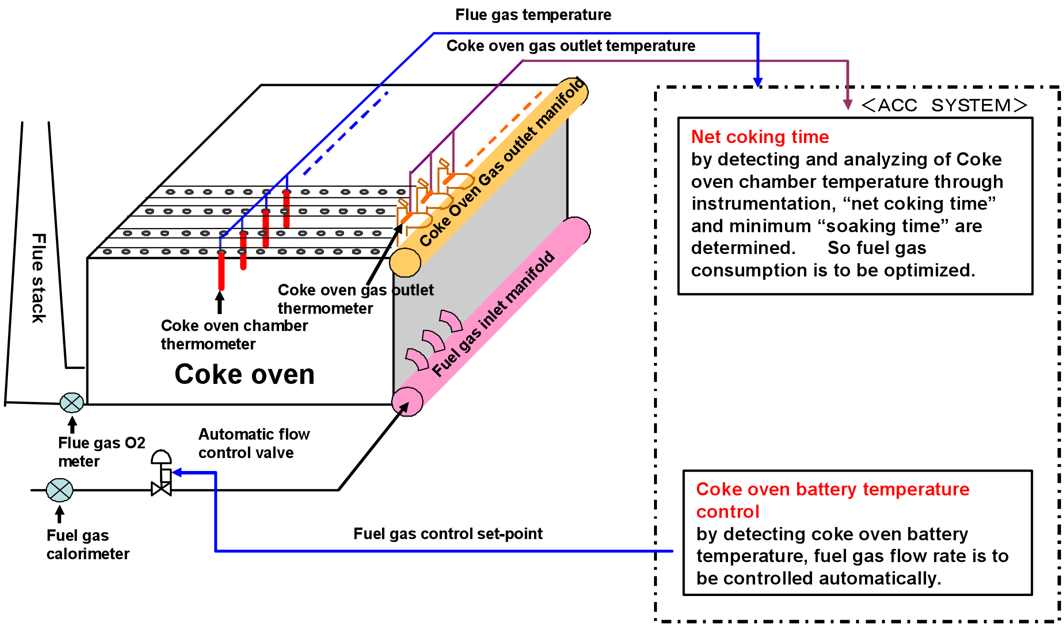


Figure 2 Conceptual scheme of the ACCS (Before (upper) and after (lower))

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

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Ex ante estimation for GHG emission reductions during the crediting period is as follows;

Year (Month)	Annual estimation of emission reductions in tonnes of CO_2 e
2013(Jan.-Dec.)	15,604
2014(Jan.-Dec.)	15,604
2015(Jan.-Dec.)	15,604
2016(Jan.-Dec.)	15,604
2017(Jan.-Dec.)	15,604
2018(Jan.-Dec.)	15,604
2019(Jan.-Dec.)	15,604
2020(Jan.-Dec.)	15,604
2021(Jan.-Dec.)	15,604
2022(Jan.-Dec.)	15,604
Total estimated reductions (tonnes of CO_2 e)	156,040
Total number of crediting years	10 years
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	15,604

A.4.4. Public funding of the small-scale project activity:

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The project receives the fund from NEDO (New Energy and Industrial Technology Development Organization, Japan), however this is not ODA budget.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

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Based on the criteria set to determine the occurrence of debundling, it is confirmed that the project activity is not a debundled component of a large project activity as the project participants did not register or applied for another small-scale CDM project activity:

- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

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AMS II.I. Efficient utilization of waste energy in industrial facilities / Version 01

B.2 Justification of the choice of the project category:

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The proposed project activity meets the applicability conditions of AMS III.I/Version 01 as follows:

Para.	Applicability conditions	The proposed project
1	This methodology comprises technologies and measures to improve the efficiency of electricity or thermal energy generation from recovered waste energy from a single source at an industrial, mining or mineral production facility. The ratio of waste energy to production output is constant for the targeted production process. Examples include replacement of a wet-type dust removal system by a dry-type system prior to a top gas pressure recovery turbine (TRT) in iron and steel industry.	The proposed project activity utilizes the technology called ACCS (the Automatic Combustion Control System) to improve the energy efficiency in the coke production process. The technology can reduce the amount of thermal energy, i.e. coke oven gas, in the coke oven, and the saved energy will be utilize to produce electricity. The ratio waste thermal energy to coke production is constant before and after the proposed project starts.
2(a)	The methodology is applicable under the following conditions: (a) Production process has homogeneous outputs and it is possible to directly measure and record energy efficiency parameters such as production output, thermal and/or electrical energy produced including the sources used for energy production;	The proposed project can directly measure and record parameters which are necessary to quantify the incremental gain of COG and electricity. These parameters include e.g. COG volume flow at several points, production of coke by weight, electricity generation.
2(b)	The impact of the measures implemented (improvements in energy efficiency) by the project activity can be clearly distinguished from changes in energy use due to other variables not influenced by the project activity (signal to noise ratio);	COG balances in the plant will be monitored, and amount of COG generated per tons of cokes will not be significantly changed before and after the project starts. Therefore, it is possible to distinguish the impact of the measures implemented by the project activity.
2(c)	Production outputs (e.g., hot metal) in baseline and project scenario remain homogenous and within a range of ±10% with no change in installed capacity. The methodology is not applicable to project activities for retrofit of an existing facility to increase production outputs;	The production capacity will not be changed after the proposed project starts, and not aiming retrofit of increasing the coke production. At the current assessment, the coke production will be within the range of ±10% and not changed significantly between with and without the project.
2(d)	(d) No auxiliary fuel is used and/or co-firing for energy generation in the project activity does not take place.	No auxiliary fuel will be used in the project activity.

3	The methodology covers both new and existing facilities; in the case of capacity expansion, added capacity shall be treated as a new facility.	The proposed project is implemented at an existing coke plant.
4	For new facilities the most plausible baseline scenario for the project activity shall be evaluated based on the assessment of the alternatives to the project activity. For this purpose steps 1 to 3 of the most recent version of "Combined tool to identify the baseline scenario and demonstrate additionality" shall be used. If the identified baseline scenario is the same as the baseline of the methodology, and it can be demonstrated that the implementation of the project as 'the proposed project activity undertaken without being registered as CDM', is not the common practice in the region, project participants can apply this methodology.	The proposed project is implemented at an existing coke plant.
5	Project activities involving use of waste gas/heat or waste pressure that would have been flared or released into the atmosphere in the absence of the project activity are eligible under AMS III.Q.	The proposed project does not involve use of waste gas/heat or waste pressure that would have been flared or released into the atmosphere in the absence of the project activity
6	The aggregate energy saving of a single project shall not exceed the equivalent of 60 GWh of electricity per year. For fossil fuel use, the limit is 180 GWh thermal per year in fuel input.	The project activity will remain under the limits of the equivalent of 60 GWhe or 180 GWhth in any year of the crediting period

B.3. Description of the project boundary:

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According the AMS.II.I, the project boundary encompasses the physical, geographical site of the coke production plant. Electricity generated from the proposed project activity will be delivered to Hebei Power Grid and will replace the electricity generated by fossil fuel in the grid. The grid is then defined as the part of the project boundary.

In the table below, all sources of the baseline and the project activity are listed.

Table 1 Emissions sources of the baseline and the project activity

Source		Gas	Included?	Justification / Explanation
Baseline emissions	CO_2 emissions from electricity generation in fossil fuel fired power plants that	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source.

	are displaced due to the project activity.	N_2O	No	Minor emission source.
Project emissions	Not applicable	-	-	-

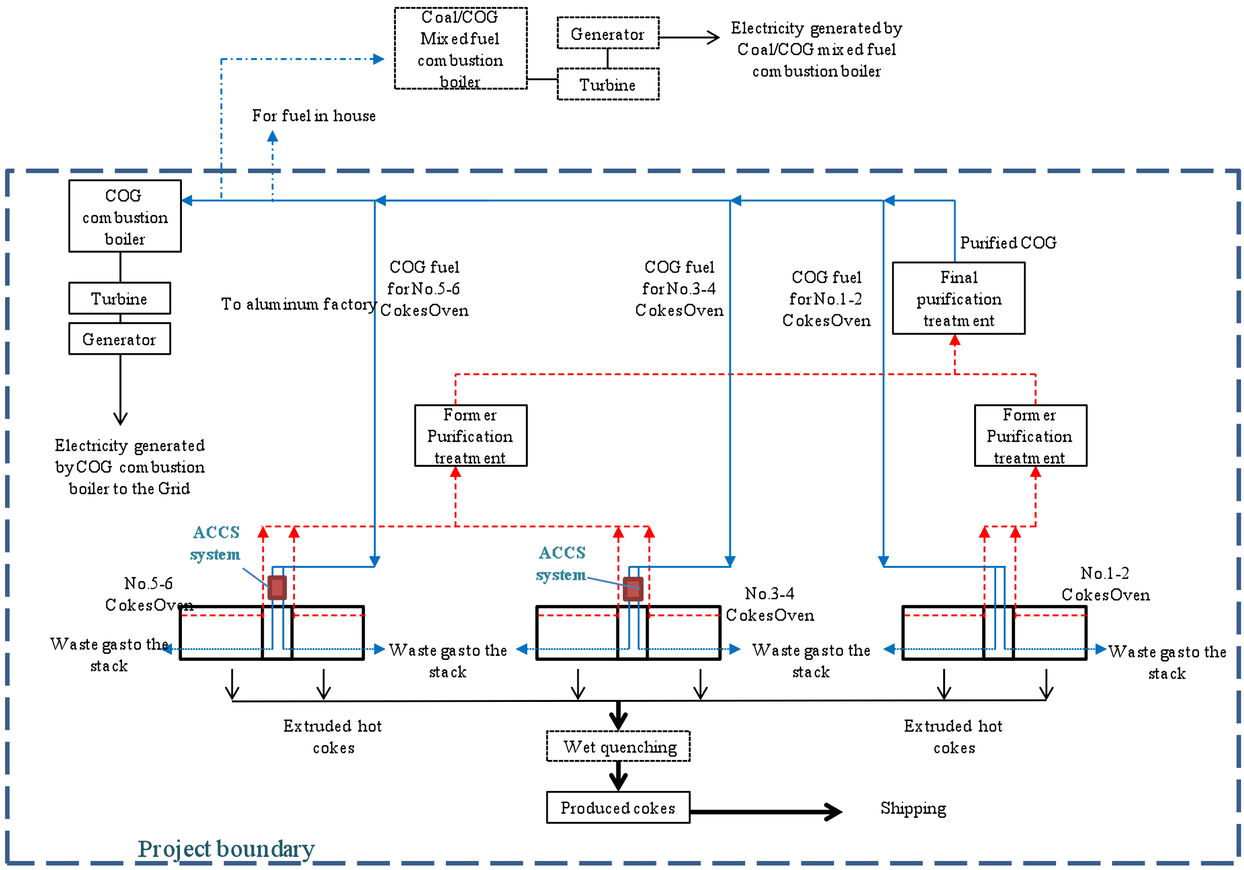

Figure 3 Configuration of the cokes production plant at Yangguang and the project boundary

B.4. Description of baseline and its development:

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The baseline scenario is the situation where in the absence of the project activity, the COG that will be saved by the project is combusted in the coke ovens and there is no incremental gain of COG to produce electricity.

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 small-scale CDM project activity:

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In line with the Attachment A to Appendix B of "The simplified modalities and procedures for small-scale CDM project activities", a project is deemed as additional if project participants can provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:
(a) Investment barriers
(b) Technological barriers
(c) Barrier due to prevailing practice
(d) Other barriers

Among these barriers, the proposed project faces the following barriers, therefore the emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity:

1) Technological barriers:
The proposed project employs unique technology called ACCS invented by a Japanese company Mitsubishi Chemical Engineering Corporation. Currently, the technology is not available in China, and these will be imported from Japan for the proposed CDM project as the first case in China. This is the first chance for Yangguan to access the technology realized by the proposal from Mitsubishi Chemical Engineering Corporation. It is required new skills and know-how for its proper operation. The supplier will provide on-the-job training to the operators, so that the operators can properly manage the technology.

2) Barrier due to prevailing practice:
The proposed project activity introducing ACCS is the first case in China, and no other coke plant introduce such kind of technology to save energy.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Baseline Emissions:

For this project, baseline monitoring will be implemented for one year prior to the project start and parameters for the baseline status are identified based on monthly data for the baseline monitoring during one year. Because there is no reliable historical data.

Baseline emissions during year y (BE_y) are determined as follows:

$$BE_y = EG_{diff,y} \times EF_{CO2,grid,y} \qquad (1)$$

Where:

BE_y	The baseline emissions in year *y* (tCO_2e)
$EG_{diff,y}$	Incremental gain of thermal energy or electricity generation in the project activity during year *y* (MWh)
$EF_{CO_2,grid,y}$	CO_2 emission factor of the grid (tCO_2 /MWh)

Incremental gain of electricity generation in the project activity during year y ($EG_{diff,y}$) is determined ex post by multiplying the improvement of the baseline EGR with the actual monitored output of the project activity after implementation. This is done as follows:

$$EG_{diff,y} = EGR_{diff,y} \times P_y \qquad (2)$$

Where:

$EGR_{diff,y}$	Difference in EGR of baseline and project activity in year *y* (kWh/tonne)
P_y	Annual production output (cokes for this project) in year *y*. In case the production output generated in year *y* is larger than the average of historical production output of the three most recent years (excluding abnormal years) before the implementation of the project activity, then the value of the production output is capped at the value of this historical average production level (tonnes)

$$P_y = Min(P_{PJ,y}, P_{HY}) \qquad (3)$$

Where:

P_y	Annual production output (cokes for this project) in year *y*. In case the production output generated in year *y* is larger than the average of production output of the three most recent years (excluding abnormal years) before the implementation of the project activity, then the value of the production output is capped at the value of this historical average production level (tonnes)
$P_{PJ,y}$	Actual annual production output (cokes for this project) in year *y* (tonnes)
P_{BL}	The annual production output of the process based on minimum of 1 year baseline monitoring data; extreme values are to be excluded from the available values of output rate, a normal production range can be defined as the range in which production levels are 10% above or below the verifiable[1] nameplate capacity (tonnes)

Difference in EGR of baseline and project activity in year *y* ($EGR_{diff,y}$) is determined as follows:

$$EGR_{diff,y} = EGR_{PJ,y} - EGR_{BL} \qquad (4)$$

[1] For examples on the basis of the construction or design specifications.

Where:

EGR_{BL} Energy Generation Ratio in the baseline (MWh/tonne)

In this project, main parameters for calculation of emission reductions are identified based on quantity of COG fuel energy saved by operation of ACCS system, which means the difference between baseline and project case. So, EGR_{BL} can be regarded as 0.

$EGR_{PJ,y}$ Energy Generation Ratio in the project activity in year *y* (MWh/tonne)

As above-mentioned, $EGR_{PJ,y}$ can be regarded as $EGR_{diff,y}$.

The Energy Generation Ratio in the baseline (EGR_{BL}) is determined as follows:

$$EGR_{BL} = \frac{EG_{HY}}{P_{HY}} \quad (5)$$

Where:

EG_{HY} Average of historical electricity or thermal energy delivered after deducting internal consumption, spanning all historic data (hourly or weekly or monthly data) up to the time at which the unit was constructed, retrofitted, or modified in a manner that significantly affected output (i.e. by 5% or more), a minimum of 3 years data is required (MWh)

P_{HY} Average of the historical annual production output of the process based on the 3-year historical data; extreme values are to be excluded from the available values of output rate, a normal production range can be defined as the range in which production levels are 10% above or below the verifiable[2] nameplate capacity (tonnes)

Equation (5) is replaced by equation (5') for this project since historical data is not available.

$$EGR_{BL} = \frac{EG_{BL}}{P_{BL}} \quad (5')$$

Where:

EG_{BL} Electricity during baseline monitoring period delivered after deducting internal consumption, spanning all baseline monitoring data (monthly data) up to the time at which the unit was constructed, retrofitted, or modified in a manner that significantly affected output (i.e. by 5% or more), a minimum of one year data is required (MWh)

P_{BL} Average of the annual production output of the process based on the 1-year baseline monitoring data; extreme values are to be excluded from the available values of output rate, a normal production range can be defined as the range in which production levels are 10% above or below the verifiable[3] nameplate capacity (tonnes)

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[2] For examples on the basis of the construction or design specifications.

[3] For examples on the basis of the construction or design specifications.

Energy Generation Ratio in the project activity in year y (EGR $_{PJ,y}$) is determined as follows:

$$EGR_{PJ} = \frac{EG_{PJ,y}}{P_{PJ,y}} \quad (6)$$

Where:

$EG_{PJ,y}$	Net electricity or thermal energy generation, which is the difference between the gross energy generation and internal consumption in year *y* (MWh) For this project, the parameter is regarded as net electricity generated by COG combustion boiler using COG fuel energy saved by operation of ACCS system.
$P_{PJ,y}$	Actual annual production output (cokes for this project) in year *y* (tonnes)

For this project, above-mentioned parameters are shown as follows;

$$EG_{PJ,y} = QCC_{PJ,y} \times Min(\varepsilon_{PJ,y}, \varepsilon_{BL}) / 100 / 3.6 \quad (7)$$

$$\varepsilon_{BL} = EGCB_{BL} / QCB_{BL} \times 3600 \quad (8)$$

$$\varepsilon_{PJ,y} = EGCB_{PJ,y} / QCB_{PJ,y} \times 3600 \quad (9)$$

$$QCC_{PJ,y} = \sum_{k=1}^{12} [P_{PJ,k} \times \{QCFR_{BL} - QCFR_{PJ,k} - Max(QCGR_{BL} - QCGR_{PJ,k}, 0)\}] \quad (10)$$

$$QCGR_{BL,i} = \frac{QCG_{BL,i}}{P_{BL,i}} \quad (11)$$

($QCGR_{BL}$ is analyzed and identified as the maximum value for 12 values of $QCGR_{BL,i}$ in conservative manner.)

$$QCGR_{PJ,k} = \frac{QCG_{PJ,k}}{P_{PJ,k}} \quad (12)$$

$$QCFR_{BL,i} = \frac{QCF_{BL,i}}{P_{BL,i}} \quad (13)$$

($QCFR_{BL}$ is analyzed and identified as the minimum value for 12 values of $QCFR_{BL,i}$ in conservative manner.)

$$QCFR_{PJ,k} = \frac{QCF_{PJ,k}}{P_{PJ,k}} \quad (14)$$

Where;

MB_i	Length of measuring interval during the baseline monitoring	Month
i	Measuring interval during the baseline monitoring	-

MP_k	Length of measuring interval in year *y* (during the project activity)		Month
k	Measuring interval in year *y*		-
P_{BL}	Average of annual production output(cokes)	in the baseline	t Cokes/y
$P_{BL,i}$	Production output(cokes)	in measuring interval *i*	t Cokes /month
$P_{PJ,y}/P_y$	Actual annual production output (cokes)	in year *y*	t Cokes/y
$P_{PJ,k}$	Production output(cokes)	in measuring interval *k*	t Cokes /month
QCG_{BL}	Net quantity of purified COG generated from cokes oven (after purification treatment)	in the baseline	GJ/y
$QCG_{BL,i}$		in measuring interval *i*	GJ/month
$QCG_{PJ,y}$		in year *y*	GJ/y
$QCG_{PJ,k}$		in measuring interval *k*	GJ/month
QCF_{BL}	Net quantity of COG consumed for cokes oven fuel	in the baseline	GJ/y
$QCF_{BL,i}$		in measuring interval *i*	GJ/month
$QCF_{PJ,y}$		in year *y*	GJ/y
$QCF_{PJ,k}$		in measuring interval *k*	GJ/month
$QCGR_{BL}$	Purified COG generation ratio	in the baseline	GJ/t Cokes
$QCGR_{BL,i}$		in measuring interval *i*	
$QCGR_{PJ,y}$		in year *y*	
$QCGR_{PJ,k}$		in measuring interval *k*	
$QCFR_{BL}$	COG fuel consumption ratio for cokes oven	in the baseline	
$QCFR_{BL,i}$		in measuring interval *i*	
$QCFR_{PJ,y}$		in year *y*	
$QCFR_{PJ,k}$		in measuring interval *k*	
$QCC_{PJ,y}$	Net quantity of COG fuel saved by the project	in year *y*	GJ/y
$QCC_{PJ,k}$		in measuring interval *k*	GJ/month
$QCB_{PJ,y}$	Net quantity of COG fuel consumed by COG combustion boiler	in year *y*	GJ/y
$QCB_{PJ,k}$		in measuring interval *k*	GJ/month
ε_{BL}	Power generation efficiency of the COG combustion boiler	in the baseline	%
$\varepsilon_{PJ,y}$		in year *y*	
$EGCB_{BL}$	Net electricity energy generated by the COG combustion boiler	in the baseline	MWh/y
$EGCB_{PJ,y}$		in year *y*	
$EG_{PJ,y}$	Net electricity energy generation, which is the difference between the gross energy generation and internal consumption	in year *y*	MWh/y
$EGR_{diff,y}$	Difference in EGR of baseline and project activity	in year *y*	$*10^{-3}$ MWh/tCokes
$EGR_{PJ,y}$	Energy Generation Ratio in the project activity	in year *y*	
$EG_{diff,y}$	Incremental gain of thermal energy or electricity generation in the project activity	in year *y*	MWh/y

Project activity emissions

According to the methodology, no project emissions are anticipated to occur, since the emission reductions are calculated as an incremental gain of energy in the project activity as compared to the baseline scenario. This incremental gain is the energy that would have been outsourced from the grid or the fossil fuel that would have been consumed in the absence of the project activity.

Leakage

In case that COG fuel saved by operation of ACCS system is utilized for other purpose than the COG combustion boiler, leakage shall be considered.
For this project, leakage is shown as follows;

$$LE_y = \sum_{k=1}^{12} [Max(QCC_{PJ,k} - QCB_{PJ,k}, 0)] \times Min(\varepsilon_{PJ,y}, \varepsilon_{BL}) / 3.6 \times EF_{CO2,grid,y} \quad (15)$$

Where;

MP_k	Length of measuring interval in year *y* (during the project activity)		Month
k	Measuring interval in year *y*		-
$QCC_{PJ,y}$	Net quantity of COG fuel saved by the project	in year *y*	GJ/y
$QCC_{PJ,k}$		in measuring interval *k*	GJ/month
$QCB_{PJ,y}$	Net quantity of COG fuel consumed by COG combustion boiler	in year *y*	GJ/y
$QCB_{PJ,k}$		in measuring interval *k*	GJ/month
ε_{BL}	Power generation efficiency of the COG combustion boiler	in the baseline	%
$\varepsilon_{PJ,y}$		in year *y*	

Emission Reductions:

The amount of emission reductions is given by

$$ER_y = BE_y - PE_y - LE_y \quad (16)$$

Where:

ER_y Emission reductions in a year *y* (tCO_2e/yr)

BE_y Baseline emissions in a year *y* (tCO_2e/yr)

PE_y Project emissions in a year *y* (tCO_2e/yr)

For this project, PE_y can be regarded as 0.

LE_y Leakage in a year *y* (tCO_2e/yr)

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

Data / Parameter:	P_{HY}
Data unit:	T Cokes/y

Description:	Average of the historical annual production output of the process based on the 3 year historical data
Source of data used:	Measuring equipments
Value applied:	2,170,700 tCokes/y for total of No.1-6 Cokes Ovens) (452,000 tCokes /y from No.1-2 Cokes Oven) (741,000 tCokes /y from No.3-4 Cokes Oven) (977,700 tCokes /y from No.5-6 Cokes Oven)
Justification of the choice of data or description of measurement methods and procedures actually applied :	For now, these values are set based on annual average production in 2008-2010 are used.
Any comment:	No.

Data / Parameter:	$EF_{CO2,grid,y}$
Data unit:	tCO_2/MWh
Description:	CO_2 emission factor of the grid in year y
Source of data used:	Published value by National Development and Reform Commission (NDRC) in China
Value applied:	0.8936 (tCO_2e/MWh)
Justification of the choice of data or description of measurement methods and procedures actually applied :	Shanxi provincial power gird is part of the Hebei Grid. Here Combined Margin (CM) of the Hebei Grid is adopted as the emission factor of the electricity for running the DeN_2O unit. Operating margin (OM) and Build Margin (BM) of the Central China Power Grid are provided as follows by National Development and Reform Commission (NDRC) updated on July. 2, 2009; - OM: 1.0069 (tCO_2/MWh) - BM: 0.7802 (tCO_2/MWh) And CM is shown as average of OM and BM.
Any comment:	No.

B.6.3 Ex-ante calculation of emission reductions:

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We estimate the emission reductions for cokes production of 2,170,000 ton/y (No.1-2 cokes oven: 452,000 ton/y, No.3-4 cokes oven: 741,000 ton/y, No.5-6 cokes oven: 977,700 ton/y) .

As described in Section B6.1, the amount of baseline emissions is given by

$$BE_y = EG_{diff,y} \times EF_{CO_2,grid,y}$$

$$EG_{diff,y} = EGR_{diff,y} \times P_y$$

$$= EGR_{diff,y} \times Min(P_{PJ,k}, P_{HY})$$

$$EGR_{diff,y} = EGR_{PJ,y} - EGR_{BL}$$
$$= EGR_{PJ,y}$$

$$EGR_{BL} = \frac{EG_{BL}}{P_{BL}}$$

$$EGR_{PJ} = \frac{EG_{PJ,y}}{P_{PJ,y}}$$

$$EG_{PJ,y} = QCC_{PJ,y} \times Min(\varepsilon_{PJ,y}, \varepsilon_{BL}) / 100 / 3.6$$

$$\varepsilon_{BL} = EGCB_{BL} / QCB_{BL} \times 3600$$

$$\varepsilon_{PJ,y} = EGCB_{PJ,y} / QCB_{PJ,y} \times 3600$$

$$QCC_{PJ,y} = \sum_{k=1}^{12} [P_{PJ,k} \times \{QCFR_{BL} - QCFR_{PJ,k} - Max(QCGR_{PJ,k} - QCGR_{BL}, 0)\}]$$

$$QCGR_{BL} = \frac{QCG_{BL}}{P_{BL}}$$

$$QCGR_{PJ,k} = \frac{QCG_{PJ,k}}{P_{PJ,k}}$$

$$QCFR_{BL} = \frac{QCF_{BL}}{P_{BL}}$$

$$QCFR_{PJ,k} = \frac{QCF_{PJ,k}}{P_{PJ,k}}$$

As described in Section B6.1, the amount of leakage is given by

$$LE_y = \sum_{k=1}^{12} [Max(QCC_{PJ,k} - QCB_{PJ,k}, 0)] \times Min(\varepsilon_{PJ,y}, \varepsilon_{BL}) / 3.6 \times EF_{CO2,grid,y}$$

As described in Section B6.1, the amount of emission reductions is given by

$$ER_y = BE_y - PE_y - LE_y$$

Ex-ante estimation of emission reductions and values applied for parameters are shown as the following table;

Parameter		Estimated value	Unit
Purified COG generation flow rate per raw coal	*FCGR*	300	Nm^3/t Dry Coal
Cokes production efficiency	*CPE*	0.74	t Cokes/t Dry Coal
Net calorific value of Purified COG	NCV_{COG}	16,318	kJ/Nm3
Purified COG generation ratio for cokes oven in the baseline	$QCGR_{BL}$	6.62	GJ/t Cokes
Purified COG generation ratio for cokes oven in year *y*	$QCGR_{PJ,y}$	6.62	GJ/t Cokes

Parameter		Estimated value				Unit
		1-2 Cokes Oven	3-4 Cokes Oven	5-6 Cokes Oven	Total	
Average of the historical annual production output of the process based on the 3 year historical data	P_{HY}	(452,000)	(741,000)	(977,700)	2,170,700	t Cokes/y
Annual production output(cokes) in the baseline	P_{BL}	(452,000)	(741,000)	(977,700)	2,170,700	t Cokes/y
Actual annual production output (cokes) in year *y*	$P_{PJ,y}$	(452,000)	(741,000)	(977,700)	2,170,700	t Cokes/y
Actual annual production output (cokes) in year *y* =Min(P_{HY},$P_{PJ,y}$)	P_y	(452,000)	(741,000)	(977,700)	2,170,700	t Cokes/y
Net quantity of purified COG generated from cokes oven (after purification treatment) in the baseline	QCG_{BL}	-	-	-	14,370,034	GJ/y
Net quantity of COG generated from cokes oven (after purification treatment) in year *y*	$QCG_{PJ,y}$	-	-	-	14,370,034	GJ/y
Net quantity of COG consumed for cokes oven fuel in the baseline	QCF_{BL}	1,496,120	2,452,710	3,236,187	7,185,017	GJ/y
COG fuel saving rate by ACCS	FCR_{ACCS}	0.0	5.0	5.0	-	%
Net quantity of COG fuel consumed for cokes oven fuel in year *y*	$QCF_{PJ,y}$	1,496,120	2,330,075	3,074,378	6,900,573	GJ/y

Purified COG generation ratio in the baseline	$QCGR_{BL}$	-	-	-	6.620	GJ/t Cokes
Purified COG generation ratio in year *y*	$QCGR_{PJ,y}$	-	-	-	6.620	GJ/t Cokes
COG fuel consumption ratio for cokes oven in the baseline	$QCFR_{BL}$	-	-	-	3.310	GJ/t Cokes
COG fuel consumption ratio for cokes oven in year *y*	$QCFR_{PJ,y}$	-	-	-	3.179	GJ/t Cokes
Net quantity of COG fuel saved by the project in year *y*	$QCC_{PJ,y}$	-	-	-	284,444	GJ/y
Net quantity of COG fuel consumed by COG combustion boiler in year *y*	$QCB_{PJ,y}$	-	-	-	284,444	GJ/y
Power generation efficiency of the COG combustion boiler in the baseline	ε_{BL}	-	-	-	22.1	%
Power generation efficiency of the COG combustion boiler in year *y*	$\varepsilon_{PJ,y}$	-	-	-	22.1	%
Net electricity energy generated by the COG combustion boiler in the baseline	$EGCB_{BL}$	-	-	-	0	MWh/y
Net electricity energy generated by the COG combustion boiler in year *y*	$EGCB_{PJ,y}$	-	-	-	17,462	MWh/y
Quantity of net electricity (generated by the COG combustion boiler) supplied to the grid in year *y*	$EG_{PJ,y}$	-	-	-	17,462	MWh/y
Difference in EGR of baseline and project activity in year *y*	$EGR_{diff,y}$	-	-	-	8.0444	$*10^{-3}$ MWh/tCokes
Energy Generation Ratio in the project activity in year *y*	$EGR_{PJ,y}$	-	-	-	8.0444	$*10^{-3}$ MWh/tCokes
Incremental gain of thermal energy or electricity generation in the project activity during year *y*	$EG_{diff,y}$	-	-	-	17,462	MWh/y
CO_2 emission factor of the grid in year y	$EF_{CO2,grid,y}$	-	-	-	0.8936	tCO_2/MWh
The baseline emissions in year *y*	BE_y	-	-	-	15,604	tCO_2/y
Project emissions in a year *y*	PE_y	-	-	-	0	tCO_2/y
Leakage in a year *y*	LE_y	-	-	-	0	tCO_2/y
Emission reductions in a year *y*	ER_y	-	-	-	15,604	tCO_2/y

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

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Ex ante estimation during the first crediting period is given as follows:

Year (Month)	Estimation of project activity emissions (tonnes of CO_2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of overall emission reductions (tonnes of CO_2 e)
2013(Jan.-Dec.)	0	15,604	0	15,604
2014(Jan.-Dec.)	0	15,604	0	15,604
2015(Jan.-Dec.)	0	15,604	0	15,604
2016(Jan.-Dec.)	0	15,604	0	15,604
2017(Jan.-Dec.)	0	15,604	0	15,604
2018(Jan.-Dec.)	0	15,604	0	15,604
2019(Jan.-Dec.)	0	15,604	0	15,604
2020(Jan.-Dec.)	0	15,604	0	15,604
2021(Jan.-Dec.)	0	15,604	0	15,604
2022(Jan.-Dec.)	0	15,604	0	15,604
Total (tonnes of CO_2 e)	0	156,040	0	156,040

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

The monitoring points for key parameters are shown below:

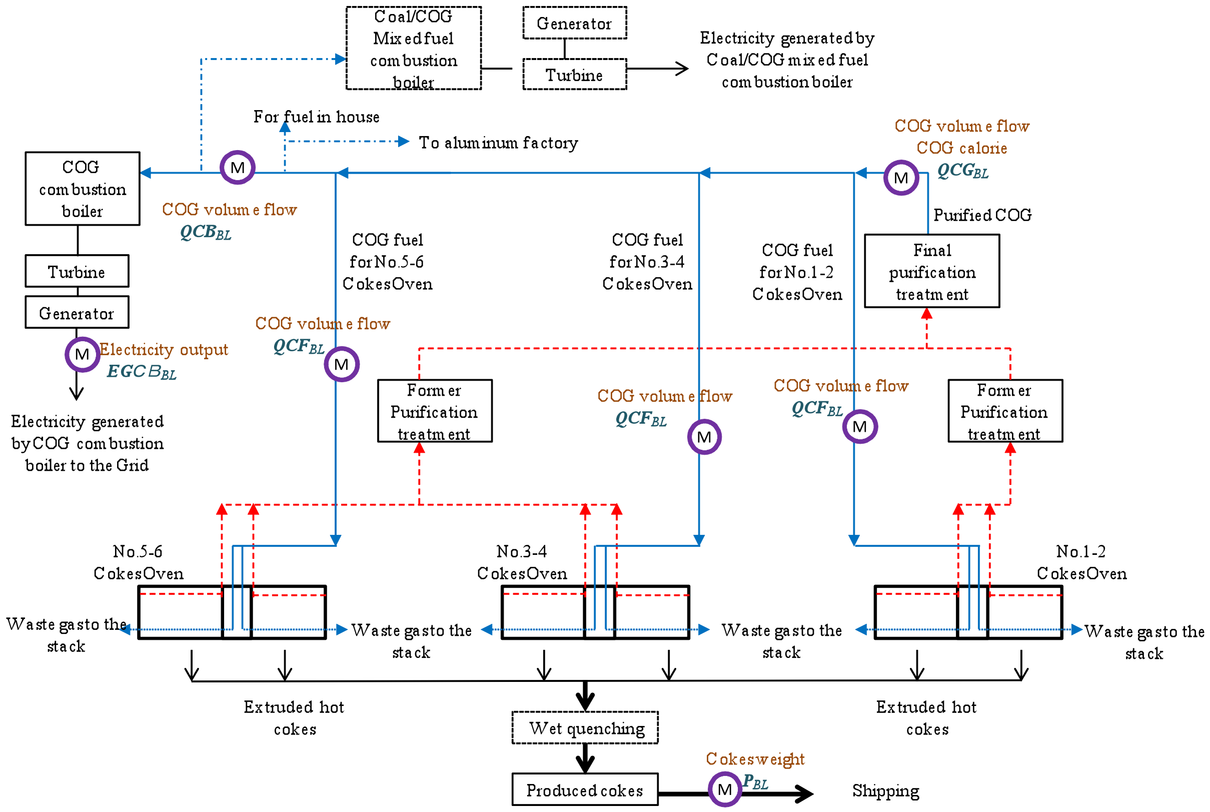

Figure 4 Monitoring points for key parameters during baseline monitoring

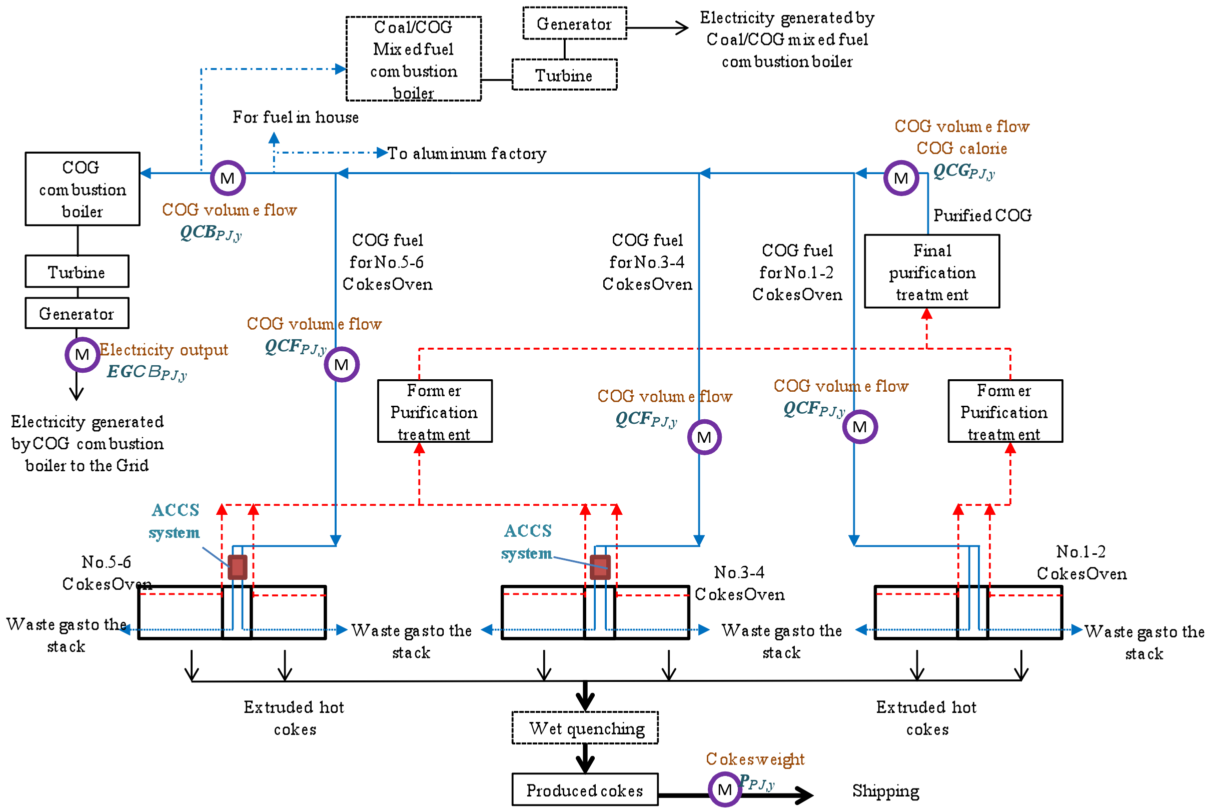

Figure 5 Monitoring points for key parameters during the project activity

B.7.1 Data and parameters monitored:

Data / Parameter:	MB_i
Data unit:	Month
Description:	Length of measuring interval during the baseline monitoring period
Source of data to be used:	Defined in the status of the cokes production process
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1 month
Description of measurement methods and procedures to be applied:	This parameter is set in to identify Difference in Energy Generation Ratio (EGR) of baseline and project activity in the baseline ($EGR_{diff,y}$) reliably. This interval is determined considering the status of the production process and time lag among monitoring parameters. Furthermore, it is needed for this project to monitor the baseline status for one year instead of the 3 year historical data for the baseline.
QA/QC procedures to be applied:	Not needed.

Any comment:	No.

Data / Parameter:	MP_k
Data unit:	Month
Description:	Length of measuring interval in year *y* (during the project activity)
Source of data to be used:	Defined in the status of the cokes production process
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1 month
Description of measurement methods and procedures to be applied:	Measuring interval during the project monitoring period is not specified by the methodology. So, the parameter is determined considering the status of the production process and time lag among monitoring parameters.
QA/QC procedures to be applied:	Not needed.
Any comment:	No.

Data / Parameter:	P_{BL}
Data unit:	T Cokes/y
Description:	Annual production output in the baseline;
Source of data used:	Measuring equipments
Value of data applied for the purpose of calculating expected emission reductions	2,170,700 tCokes/y for total of No.1-6 Cokes Ovens) (452,000 tCokes /y from No.1-2 Cokes Oven) (741,000 tCokes /y from No.3-4 Cokes Oven) (977,700 tCokes /y from No.5-6 Cokes Oven) For now, these values are set as same as P_{HY}.
Description of measurement methods and procedures to be applied:	For this project, baseline monitoring will be implemented for one year prior to the project start, because there is no reliable historical data. P_{BL} is applied for this project instead of P_{HY} (Average of the historical annual production output of the process based on the 3 year historical data). Monitoring conditions as follows; ● Measuring device : Weigh bridge (before shipment) ● Measuring period : Daily ● Recording frequency : Daily (aggregated monthly) For identification of the value of the parameter, extreme values are to be excluded from the available values of output rate, a normal production range can be defined as the range in which production levels are 10% above or

[4] For examples on the basis of the construction or design specifications.

	below the verifiable[4] nameplate capacity
QA/QC procedures to be applied:	Regular maintenance and testing regime to ensure accuracy according to the industry standard in China or the manufacturer's requirement.
Any comment:	No.

Data / Parameter:	$P_{PJ,y}$ / P_y
Data unit:	t Cokes/y
Description:	Actual annual production output (cokes) in year *y*
Source of data used:	Measuring equipments
Value of data applied for the purpose of calculating expected emission reductions	$P_{PJ,y}$ 2,170,700 tCokes/y for total of No.1-6 Cokes Ovens) (452,000 tCokes /y from No.1-2 Cokes Oven) (741,000 tCokes /y from No.3-4 Cokes Oven) (977,700 tCokes /y from No.5-6 Cokes Oven) 2,350,000 tCokes/y for total of No.1-6 Cokes Ovens) (627,000 tCokes /y from No.1-2 Cokes Oven) (752,000 tCokes /y from No.3-4 Cokes Oven) (971,000 tCokes /y from No.5-6 Cokes Oven) P_y 2,170,700 tCokes/y for total of No.1-6 Cokes Ovens) (452,000 tCokes /y from No.1-2 Cokes Oven) (741,000 tCokes /y from No.3-4 Cokes Oven) (977,700 tCokes /y from No.5-6 Cokes Oven) For now, these values are set to be same as P_{BL}.
Description of measurement methods and procedures to be applied:	Monitoring conditions as follows; ● Measuring device : Weigh bridge (before shipment) ● Measuring period : Daily ● Recording frequency : Daily (aggregated monthly) According to the methodology, $P_y=Min(P_{PJ,y}, P_{HY})$
QA/QC procedures to be applied:	Regular maintenance and testing regime to ensure accuracy according to the industry standard in China or the manufacturer's requirement.
Any comment:	No.

Data / Parameter:	QCG_{BL}
Data unit:	GJ/y
Description:	Net quantity of purified COG generated from cokes oven (after purification treatment) in the baseline

Source of data used:	Measuring equipments
Value of data applied for the purpose of calculating expected emission reductions	14,370,034 GJ/y (for total of No1-6 Cokes Ovens) For now, this value is calculated as follows; $QCG_{BL} = P_{BL} * QCGR_{BL}$ Where; P_{BL}: Annual production output (cokes) in the baseline [t Cokes /y] $QCGR_{BL}$: COG generation ratio in the baseline [GJ/t Cokes]
Description of measurement methods and procedures to be applied:	Monitoring conditions as follows; ● Measuring device: Volume flow meter (Karman type) with temperature sensor and pressure transmitter and calorimeter ● Measuring point: Total COG gas duct (for all ovens) after pre-treatment units ● Measuring frequency: Continuously ● Recording frequency: Hourly (aggregated monthly)
QA/QC procedures to be applied:	Regular maintenance and testing regime to ensure accuracy according to the industry standard in China or the manufacturer's requirement.
Any comment:	No.

Data / Parameter:	$QCG_{PJ,y}$
Data unit:	GJ/y
Description:	Net quantity of purified COG generated from cokes oven (after purification treatment) in year *y*
Source of data used:	Measuring equipments
Value of data applied for the purpose of calculating expected emission reductions	14,370,034 GJ/y (for total of No1-6 Cokes Ovens) For now, these values are set to be same as QCB_{BL}.
Description of measurement methods and procedures to be applied:	Monitoring conditions as follows; ● Measuring device: Volume flow meter (Karman type) with temperature sensor and pressure transmitter and calorimeter ● Measuring point: Total COG gas duct (for all ovens) after purification treatment ● Measuring frequency: Continuously ● Recording frequency: Hourly (aggregated monthly)
QA/QC procedures to be applied:	Regular maintenance and testing regime to ensure accuracy according to the industry standard in China or the manufacturer's requirement.
Any comment:	No.

Data / Parameter:	QCF_{BL}
Data unit:	GJ/y
Description:	Net quantity of COG consumed for cokes oven fuel in the baseline
Source of data used:	Measuring equipments

Value of data applied for the purpose of calculating expected emission reductions	7,185,017 GJ/y (for total of No.1-6 Cokes Ovens) • No.1-2 Cokes Oven: 1,496,120 GJ/t Cokes • No.3-4 Cokes Oven: 2,452,710 GJ/t Cokes • No.5-6 Cokes Oven: 3,236,187 GJ/t Cokes For now, these value are roughly set as 50% of QCG_{BL}
Description of measurement methods and procedures to be applied:	Monitoring conditions are as follows; ● Measuring device: Volume flow meter (Karman type) with temperature sensor and pressure transmitter and calorimeter ● Measuring point: Calorimeter: Total COG gas duct (for all ovens) after purification Volume flow meter with normalizing function: Inlet of cokes ovens ● Measuring frequency: Continuously ● Recording frequency: Hourly (aggregated monthly for $QCF_{BL,i}$ in measuring interval *i*)
QA/QC procedures to be applied:	Regular maintenance and testing regime to ensure accuracy according to the industry standard in China or the manufacturer's requirement.
Any comment:	No.

Data / Parameter:	$QCF_{PJ,y}$
Data unit:	GJ/y
Description:	Net quantity of COG consumed for cokes oven fuel in year *y*
Source of data used:	Measuring equipments
Value of data applied for the purpose of calculating expected emission reductions	6,900,573 GJ/y (for total of No.1-6 Cokes Ovens) • No.1-2 Cokes Oven: 1,496,120 GJ/t Cokes • No.3-4 Cokes Oven: 2,330,075 GJ/t Cokes • No.5-6 Cokes Oven: 3,074,378 GJ/t Cokes For now, this parameter is set as the following assumption; No.1-2 coke oven, this value is set to be same as $QCF_{BL,}$ because ACCS system is not installed. As for 3-4 and 5-6 cokes ovens, these values are set on the assumption that 5% of COG fuel is saved by ACCS system.
Description of measurement methods and procedures to be applied:	Monitoring conditions are as follows; ● Measuring device: Volume flow meter (Karman type) with temperature sensor and pressure transmitter and calorimeter ● Measuring point: Calorimeter: COG gas duct (for all ovens) after purification Volume flow meter with normalizing function: Inlet of cokes ovens ● Measuring frequency: Continuously ● Recording frequency: Hourly (aggregated monthly for $QCF_{PJ,k}$ in measuring interval *k*)
QA/QC procedures to	Regular maintenance and testing regime to ensure accuracy according to the industry standard in China or the manufacturer's requirement.

be applied:	
Any comment:	No.

Data / Parameter:	***$QCGR_{BL}$***
Data unit:	GJ/t Cokes
Description:	Purified COG generation ratio in the baseline
Source of data used:	Calculated and analysed by $QCG_{BL,i}$ and $P_{BL,i}$
Value of data applied for the purpose of calculating expected emission reductions	6.62 GJ/t Cokes For now, this parameter is set as the flowing; $QCGR_{BL}$= FCGR/CPE*NCV_{COG}*10^{-6} Where; FCGR: Purified COG generation flow rate per raw coal [Nm^3/t Dry Coal] 300[Nm^3/t Dry Coal] according to technical report of cokes design authority for the local area CPE: Cokes production efficiency [t Cokes/t Dry Coal] 0.74[t Cokes/t Dry Coal] according to the average value of production records in 2008- NCV_{COG}: Net calorific value of Purified COG [kJ/Nm^3] 16,318 kJ/Nm^3 according to analysis data in Yangguang's laboratory
Description of measurement methods and procedures to be applied:	This parameter is shown as follows; $QCGR_{BL,i}$= $QCG_{BL,i}$ /$P_{BL,i}$ $QCGR_{BL}$ is identified as the maximum value for 12 monthly data in conservative manner.
QA/QC procedures to be applied:	Not needed.
Any comment:	No.

Data / Parameter:	***$QCGR_{PJ,y}$***
Data unit:	GJ/t Cokes
Description:	Purified COG generation ratio in year *y*
Source of data used:	Calculated and analysed by $QCG_{PJ,k}$ and $P_{PJ,k}$
Value of data applied for the purpose of calculating expected	6.62 GJ/tonnes For now, these values are set to be same as $QCGR_{BL}$.

emission reductions	
Description of measurement methods and procedures to be applied:	This parameter is shown as follows; $QCGR_{PJ,k} = QCG_{PJ,k} / P_{PJ,k}$
QA/QC procedures to be applied:	Not needed.
Any comment:	No.

Data / Parameter:	$QCFR_{BL}$
Data unit:	GJ/tonnes
Description:	COG fuel consumption Ratio for cokes oven in the baseline
Source of data used:	Calculated and analysed by $QCF_{BL,i}$ and $P_{BL,i}$
Value of data applied for the purpose of calculating expected emission reductions	3.31 GJ/t Cokes (for total of No.1-6 Cokes Ovens) For now, these value are roughly set as 50% of $QCGR_{BL}$
Description of measurement methods and procedures to be applied:	This parameter is shown as follows; $QCFR_{BL,i} = QCF_{BL,i} / P_{BL,i}$ $QCFR_{BL}$ is identified as the minimum value for 12 monitoring data in conservative manner.
QA/QC procedures to be applied:	Not needed.
Any comment:	No.

Data / Parameter:	$QCFR_{PJ,y}$
Data unit:	GJ/t Cokes
Description:	COG fuel consumption ratio for cokes oven in year *y*
Source of data used:	Calculated and analysed by $QCF_{PJ,k}$ and $P_{PJ,k}$
Value of data applied for the purpose of calculating expected emission reductions	3.179 GJ/t Cokes (for total of No.1-6 Cokes Ovens) For now, this parameter is set as the following assumption; No.1-2 coke oven, this value is set to be same as $QCFR_{BL,}$ because ACCS system is not installed. As for 3-4 and 5-6 cokes ovens, these values are set on the assumption that 5% of COG fuel is saved by ACCS system.

Description of measurement methods and procedures to be applied:	This parameter is shown as follows; $QCFR_{PJ,k}= QCF_{PJ,k}/P_{PJ,k}$
QA/QC procedures to be applied:	Not needed.
Any comment:	No.

Data / Parameter:	$QCC_{PJ,y}$
Data unit:	GJ/y
Description:	Net quantity of COG fuel saved by the project in year *y*
Source of data used:	Calculated by $P_{PJ,k}$,$QCFR_{BL}$,$QCFR_{PJ,k}$, $QCGR_{PJ,k}$ and $QCGR_{BL}$
Value of data applied for the purpose of calculating expected emission reductions	284,444 GJ/y For now, this value is calculated as follows; $QCC_{PJ,y}= \{QCFR_{BL} - QCFR_{PJ,y} - Max(QCGR_{BL} - QCGR_{PJ,y},0)*P_{PJ,y}$
Description of measurement methods and procedures to be applied:	This parameter is shown as follows; $QCC_{PJ,y}= \sum_{k=1}^{12} [P_{PJ,k} * \{QCFR_{BL} - QCFR_{PJ,k} - Max(QCGR_{BL} - QCGR_{PJ,k} ,0)\}]$
QA/QC procedures to be applied:	Not needed.
Any comment:	No.

Data / Parameter:	QCB_{BL}
Data unit:	GJ/y
Description:	Net quantity of COG fuel consumed by the COG combustion boiler in the baseline (For the project, this parameter include net quantity of COG consumed by Coal/COG mixed fuel combustion boilers.)
Source of data used:	Measuring equipments
Value of data applied for the purpose of calculating expected emission reductions	0 GJ/y For now, this parameter is set as 0.
Description of measurement methods and procedures to be applied:	Monitoring conditions are as follows; ● Measuring device: Volume flow meter (Karman type) with temperature sensor and pressure transmitter and calorimeter ● Measuring point Calorimeter: Total COG gas duct (for all ovens) after purification Volume flow meter with normalizing function: COG combustion boiler

	● Measuring frequency: Continuously ● Recording frequency: Hourly (aggregated monthly for $QCB_{BL,i}$ in measuring interval *i*)
QA/QC procedures to be applied:	Regular maintenance and testing regime to ensure accuracy according to the industry standard in China or the manufacturer's requirement.
Any comment:	No.

Data / Parameter:	$QCB_{PJ,y}$
Data unit:	GJ/y
Description:	Net quantity of COG fuel consumed by the COG combustion boiler in year *y* (For the project, this parameter include net quantity of COG consumed by Coal/COG mixed fuel combustion boilers.)
Source of data used:	Measuring equipments
Value of data applied for the purpose of calculating expected emission reductions	284,444 GJ/y For now, this parameter is set to be same as $QCC_{PJ,y}$.
Description of measurement methods and procedures to be applied:	Monitoring conditions are as follows; ● Measuring device: Volume flow meter (Karman type) with temperature sensor and pressure transmitter and calorimeter ● Measuring point Calorimeter: Total COG gas duct (for all ovens) after purification Volume flow meter with normalizing function: the COG combustion boiler ● Measuring frequency: Continuously ● Recording frequency: Hourly (aggregated monthly for $QCB_{PJ,k,}$in measuring interval *k*)
QA/QC procedures to be applied:	Regular maintenance and testing regime to ensure accuracy according to the industry standard in China or the manufacturer's requirement.
Any comment:	No.

Data / Parameter:	$EGCB_{BL}$
Data unit:	MWh/y
Description:	Net electricity energy generated by the COG combustion boiler in the baseline
Source of data used:	Measuring equipments
Value of data applied for the purpose of calculating expected emission reductions	0 MWh/y For now, this value is set to be 0.
Description of measurement methods and procedures to be applied:	Monitoring conditions as follows; ● Measuring device : Power meter for electricity generator (on single purpose of the COG combustion boiler) ● Recording frequency : Monthly

QA/QC procedures to be applied:	Regular maintenance and testing regime to ensure accuracy according to the industry standard in China or the manufacturer's requirement.
Any comment:	This parameter is used to identify ε_{BLy}.

Data / Parameter:	***$EGCB_{PJ,y}$***
Data unit:	MWh/y
Description:	Net electricity energy generated by the COG combustion boiler in year *y*
Source of data used:	Measuring equipments
Value of data applied for the purpose of calculating expected emission reductions	17,462 MWh/y For now, this value is calculated as follows; $EGCB_{PJ,y} = QCB_{PJ,y} * \varepsilon_{PJ,y} /3,600$
Description of measurement methods and procedures to be applied:	Monitoring conditions as follows; ● Measuring device : Power meter for electricity generator (on single purpose of the COG combustion boiler) ● Recording frequency : Monthly
QA/QC procedures to be applied:	Regular maintenance and testing regime to ensure accuracy according to the industry standard in China or the manufacturer's requirement.
Any comment:	This parameter is used to identify $\varepsilon_{PJ,y}$.

Data / Parameter:	ε_{BL}
Data unit:	%
Description:	Power generation efficiency of the COG combustion boiler in the baseline
Source of data used:	Calculated by $EGCB_{BL}$ and QCB_{BL}
Value of data applied for the purpose of calculating expected emission reductions	22.1 **%** For now, this parameter is estimated roughly.
Description of measurement methods and procedures to be applied:	This parameter is shown as follows; $\varepsilon_{BL} = EGCB_{BL} / QCB_{BL} *3,600$ Although $_{QCBBL}$ include net quantity of COG consumed by Coal/COG mixed fuel combustion boilers, ε_{BL} can be identified in conservative manner.
QA/QC procedures to be applied:	Not needed.
Any comment:	No.

Data / Parameter:	$\varepsilon_{PJ,y}$
Data unit:	%
Description:	Power generation efficiency of the COG combustion boiler in year *y*

Source of data used:	Calculated by $EGCB_{PJ,y}$ and $QCB_{BL,y}$
Value of data applied for the purpose of calculating expected emission reductions	22.1 **%** For now, this parameter is estimated roughly.
Description of measurement methods and procedures to be applied:	This parameter is shown as follows; $\varepsilon_{PJ,y} = EGCB_{PJ,y} / QCB_{PJ,y}$ *3,600 Although $QCB_{PJ,y}$ include net quantity of COG consumed by Coal/COG mixed fuel combustion boilers, $\varepsilon_{PJ,y}$ can be identified in conservative manner.
QA/QC procedures to be applied:	Not needed.
Any comment:	No.

Data / Parameter:	***$EG_{PJ,y}$***
Data unit:	MWh/y
Description:	Net electricity energy generation, which is the difference between the gross energy generation and internal consumption in year *y* (MWh)
Source of data used:	Calculated by $QCC_{PJ,y}$, $\varepsilon_{PJ,y}$ and ε_{BL}
Value of data applied for the purpose of calculating expected emission reductions	17,462 MWh/y For now, this value is set as same as to be $EGCB_{PJ,y}$.
Description of measurement methods and procedures to be applied:	This parameter is shown as follows; $EG_{PJ,y} = QCC_{PJ,y} / 3.6 * Min(\varepsilon_{PJ,y}, \varepsilon_{PJ,y})/100$
QA/QC procedures to be applied:	Not needed.
Any comment:	As for power generation efficiency, the lower value between $\varepsilon_{PJ,y}$ and ε_{BL} is applied for this project in conservative manner.

Data / Parameter:	***$EGR_{PJ,y}$/$EGR_{diff,y}$***
Data unit:	MWh/t Cokes
Description:	Energy Generation Ratio in the project activity in year *y* /Difference in EGR of baseline and project activity in year *y*
Source of data used:	Calculated by $QCC_{PJ,k}$, $QCB_{PJ,k}$, $\varepsilon_{PJ,y}$ and ε_{BL}
Value of data applied for the purpose of calculating expected emission reductions	$8.0444 * 10^{-3}$ MWh/t Cokes For now, this parameter is calculated as follows; $EGR_{diff,y} = EG_{PJ,y}/P_{PJ,y}$

Description of measurement methods and procedures to be applied:	This parameter is shown as follows; EGR_{PJ} $(=EGR_{diff,y}) = EG_{PJ,y}/P_{PJ,y}$
QA/QC procedures to be applied:	Not needed.
Any comment:	No.

Data / Parameter:	***EGR_{BL}***
Data unit:	MWh/t Cokes
Description:	Energy Generation Ratio in the baseline
Source of data used:	Calculation
Value of data applied for the purpose of calculating expected emission reductions	0 MWh/t Cokes
Description of measurement methods and procedures to be applied:	For this project, this value can be regarded as 0.
QA/QC procedures to be applied:	Not needed.
Any comment:	No.

Data / Parameter:	***$EG_{diff,y}$***
Data unit:	MWh/y
Description:	Incremental gain of thermal energy or electricity generation in the project activity during year y (MWh)
Source of data used:	Calculated by $EGR_{diff,y}$ and P_y
Value of data applied for the purpose of calculating expected emission reductions	17,462 MWh/y
Description of measurement methods and procedures to be applied:	This parameter is shown as follows; $EG_{diff,y} = EGR_{diff,y} * P_y$
QA/QC procedures to be applied:	Not needed.
Any comment:	No.

B.7.2 Description of the monitoring plan:

>>

Yangguang has implemented Quality Standard ISO9001/14001 and has been operating the coking plants since the commissioning of the plant and has sufficient and well-experienced staffs.
Yangguang will bear full responsibility for project operation and management (monitoring, facilities operation and maintenance, accounting, subcontracting, personnel affairs, reporting, etc.).
Yangguang has been operating cokes production plant since the commissioning of this plant and has sufficient and well-experienced staff. In order to ensure the successful operation of the project and the creditability and verifiability of the CERs achieved, the project will have a well-defined management and operational system, and Japanese project participants will support Yangguang for the monitoring.
Chief of Production Department is responsible for preparation of the monitoring report, maintenance of monitoring instruments including calibration and filing the recorded data, being supported by Mitsubishi Chemical Engineering Corporation.

In the project, quality control and quality assurance will be carried out by the following methods.

- Management will prepare written procedures for operating facilities. Written procedures, containing daily work contents, periodic maintenance methods and judgment criteria, etc., will be compiled according to appropriate formats.
- Management will check reports from operating personnel and determine there are no problems according to the procedures. If problems are found in such checks, management will implement the appropriate countermeasures with appropriate timing.
- Management will everyday file and store reports from monitoring engineer according to the procedures.
- In the event of accidents (including malfunction of measuring equipments/logging system, abnormality of the cokes oven and the COG combustion boiler), management will ascertain the causes, implement and instruct countermeasures to the operating personnel.
- In cases of emergency, operating personnel will take stopgap measures and implement countermeasures according to instructions from management.
- Measuring instruments will be periodically and appropriately calibrated according to the procedures. Calibration timing and methods will be in accordance with “relevant industry standards or the manufacturer’s requirement”.
- The logging data and all reports printed out from the system are kept during the credit period plus 2 years.
- Measured data will also be subject to audit by government agencies in the host country. Where appropriate, the internal audit will be conducted and the monitoring data is periodically checked.

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

>>

Name/Entity of the application of the baseline and monitoring methodologies:

Mr. Hiromichi Suzuki and Mr. Kunio Sakuma
Mitsubishi Chemical Engineering Corporation
suzuki.hiromichi@me.m-kagaku.co.jp

Completion date:

31/01/2011

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>

01/09/2011 (to be expected)
(This is expected date of the purchase order for the monitoring equipments. And this is the earliest date of the commitments of the significant expenditure for the project activity.)

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

>>

25 years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

>>

01/01/2013 or after the date of registration, whichever is later

C.2.1.2. Length of the first crediting period:

>>

10 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

n.a.

C.2.2.2. Length:

>>

n.a.

SECTION D. Environmental impacts

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D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

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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:

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For now, the Environmental Impact Assessment (EIA) is not necessary for this project activity under the law in China, because it will not increase the current design capacity for cokes production.

SECTION E. Stakeholders' comments

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

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E.2. Summary of the comments received:

>>

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

>>

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	
Street/P.O.Box:	
Building:	
City:	
State/Region:	
Postfix/ZIP:	
Country:	
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by:	
Title:	
Salutation:	
Last Name:	
Middle Name:	
First Name:	
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The project receives the fund from NEDO (New Energy and Industrial Technology Development Organization, Japan), however this is not ODA budget.

Annex 3

BASELINE INFORMATION

Parameters used to estimate emission reductions

Parameter		Estimated value	Unit
Purified COG generation flow rate per raw coal	*FCGR*	300	Nm^3/t Dry Coal
Cokes production efficiency	*CPE*	0.74	t Cokes/t Dry Coal
Net calorific value of Purified COG	NCV_{COG}	16,318	kJ/Nm3
Purified COG generation ratio for cokes oven in the baseline	$QCGR_{BL}$	6.62	GJ/t Cokes
Purified COG generation ratio for cokes oven in year *y*	$QCGR_{PJ,y}$	6.62	GJ/t Cokes

Parameter		Estimated value				Unit
		1-2 Cokes Oven	3-4 Cokes Oven	5-6 Cokes Oven	Total	
Average of the historical annual production output of the process based on the 3 year historical data	P_{HY}	(452,000)	(741,000)	(977,700)	2,170,700	t Cokes/y
Annual production output(cokes) in the baseline	P_{BL}	(452,000)	(741,000)	(977,700)	2,170,700	t Cokes/y
Actual annual production output (cokes) in year *y*	$P_{PJ,y}$	(452,000)	(741,000)	(977,700)	2,170,700	t Cokes/y
Actual annual production output (cokes) in year *y* =Min(P_{HY},$P_{PJ,y}$)	P_y	(452,000)	(741,000)	(977,700)	2,170,700	t Cokes/y
Net quantity of purified COG generated from cokes oven (after purification treatment) in the baseline	QCG_{BL}	-	-	-	14,370,034	GJ/y
Net quantity of COG generated from cokes oven (after purification treatment) in year *y*	$QCG_{PJ,y}$	-	-	-	14,370,034	GJ/y
Net quantity of COG consumed for cokes oven fuel in the baseline	QCF_{BL}	1,496,120	2,452,710	3,236,187	7,185,017	GJ/y
COG fuel saving rate by ACCS	FCR_{ACCS}	0.0	5.0	5.0	–	%

Net quantity of COG fuel consumed for cokes oven fuel in year *y*	$QCF_{PJ,y}$	1,496,120	2,330,075	3,074,378	6,900,573	GJ/y
Purified COG generation ratio in the baseline	$QCGR_{BL}$	-	-	-	6.620	GJ/t Cokes
Purified COG generation ratio in year *y*	$QCGR_{PJ,y}$	-	-	-	6.620	GJ/t Cokes
COG fuel consumption ratio for cokes oven in the baseline	$QCFR_{BL}$	-	-	-	3.310	GJ/t Cokes
COG fuel consumption ratio for cokes oven in year *y*	$QCFR_{PJ,y}$	-	-	-	3.179	GJ/t Cokes
Net quantity of COG fuel saved by the project in year *y*	$QCC_{PJ,y}$	-	-	-	284,444	GJ/y
Net quantity of COG fuel consumed by COG combustion boiler in year *y*	$QCB_{PJ,y}$	-	-	-	284,444	GJ/y
Power generation efficiency of the COG combustion boiler in the baseline	ε_{BL}	-	-	-	22.1	%
Power generation efficiency of the COG combustion boiler in year *y*	$\varepsilon_{PJ,y}$	-	-	-	22.1	%
Net electricity energy generated by the COG combustion boiler in the baseline	$EGCB_{BL}$	-	-	-	0	MWh/y
Net electricity energy generated by the COG combustion boiler in year *y*	$EGCB_{PJ,y}$	-	-	-	17,462	MWh/y
Quantity of net electricity (generated by the COG combustion boiler) supplied to the grid in year *y*	$EG_{PJ,y}$	-	-	-	17,462	MWh/y
Difference in EGR of baseline and project activity in year *y*	$EGR_{diff,y}$	-	-	-	8.0444	$*10^{-3}$ MWh/tCokes
Energy Generation Ratio in the project activity in year *y*	$EGR_{PJ,y}$	-	-	-	8.0444	$*10^{-3}$ MWh/tCokes
Incremental gain of thermal energy or electricity generation in the project activity during year *y*	$EG_{diff,y}$	-	-	-	17,462	MWh/y
CO_2 emission factor of the grid in year y	$EF_{CO2,grid,y}$	-	-	-	0.8936	tCO_2/MWh

Annex 4

MONITORING INFORMATION

COG gas flow rate and calorie:

Karman type flow meter is used to measure COG gas flow rate. The flow rate is converted to the one at the normal conditions by temperature and pressure measured by temperature and pressure transmitters. Furthermore, calorie of COG gas just after purification is continuously measured by calorimeter. Therefore, the following parameters are logged as unit of J/hr

- Net quantity of purified COG generated from cokes oven (QCG_{BL}, $QCG_{PJ,y}$)
- Net quantity of COG consumed for cokes oven fuel (QCF_{BL}, $QCF_{PJ,y}$)
- Net quantity of COG fuel consumed by the COG combustion boiler (QCB_{BL}, $QCB_{PJ,y}$)

- - - - -