VCS 2007 Monitoring Report

Chuanwei Group 24MW Waste Gas Based Captive Power Plant Project

Monitoring period:

01/01/2007 – 09/09/2008

Version 5.1

March 23rd, 2009

Climate Bridge Ltd.

1. Introduction

The purpose of this report is to calculate the emission reductions generated by Chuanwei Group 24MW Waste Gas based Captive Power Plant Project (hereafter refers to the proposed project) located in Neijiang City, Sichuan Provinces, China during the crediting and monitoring period covered by this report, and to serve as basis for the verification and issuance of corresponding VCUs.

1.1 Monitoring Period

From 01/01/2007 to 09/09/2008

1.2 Document Reference

Version: 5.1
Date: Mar. 23rd, 2009

2. General Description of the Project

2.1 Summary

The proposed project activity involves installation of two sets of 12MW condensing turbine generators. The objective of the proposed project is to utilize the blast furnace gas (hereafter referred to as BFG) of Chuanwei Group which would be flared in the absence of the proposed project to generate electricity, displacing part of electricity supplied by fossil fuel-fired power plants of the Central China Grid. The proposed project started construction on June 30th, 2004 and began electricity production at the end of July 2006[1]. The proposed project was registered as a CDM project on September 10th 2008[2].

The two condensing turbine generators, located in the power plant of Chuanwei Group, are named as 1# generator and 7# generator, separately. Besides those two generators involved in the CDM activity, there have 5 other small generators not included in the CDM activity in the power plant, each with a capacity of 3MW, which are named as from 2# generator to 6# generator.

The proposed project is sited within Lianjie Town, Weiyuan Country, Neijiang City of Sichuan Province, P.R. China. It is 41 km north-west to the Weiyuan Country and 68 km east to the Renshou Country. The location is showed in Figure 2-1.

[1] Please refer to the permission for start generation provided by Chuanwei Group.
[2] http://cdm.unfccc.int/Projects/DB/DNV-CUK1197537544.71/view

Figure 2-1 Location of the proposed project

2.3 Technical Description of the Project Activity

The proposed project activity involves the installation of two sets of 12MW condensing turbine generators which will combust blast furnace gas (hereafter referred to as BFG). Key technical indicators of the boiler, turbine and generator are listed in Table 2-1.

Table 2-1 key technical indicators of the main equipments

Boiler	
Rated steam generation capacity:	75t/h
Rated steam pressure:	3.82MPa
Rated steam temperature:	450℃
Turbine	
Model type:	N12-3.43/435
Rated power:	12MW

Rated rotation velocity:	3000r/min
Intake temperature:	435℃
Generator	
Model type:	QF1-12-2A
Rated power:	12MW
Rated voltage:	6300V
Rated rotation velocity:	3000r/min

3. Monitoring Methodology and Plan

3.1 Monitoring Methodology

The project activity uses the approved consolidated baseline and monitoring methodology ACM0004: "Consolidated baseline methodology for waste gas and/or heat and/or pressure for power generation" (Version 02) and the approved methodology ACM0002 (version 06) "Consolidated methodology for grid-connected electricity generation from renewable sources".

3.2 Monitoring Data and Parameters

The following listed parameters are required to be monitored during the proposed crediting period in compliance with the project monitoring plan described in the project PDD.

Data / Parameter:	EG_{gen}
Data unit:	MWh
Description:	Electricity generated by the project in year y
Source of data to be used:	Obtained from continuously measurement.
Description of measurement methods and procedures to be applied:	Continuously measured by ammeter No. 501 for 1# generator and ammeter No. 581 for 7# generator by DCS, and automatically recorded per hour.
QA/QC procedures to be applied:	Electricity generation and auxiliary electricity consumption are used to ensure the consistency.

Data / Parameter:	EG_{AUX}
Data unit:	MWh
Description:	Auxiliary electricity consumption by the project in year y
Source of data to be used:	Obtained from continuously measurement.
Description of measurement methods and procedures to be applied:	Continuously measured by ammeter No. 502 for 1# generator and ammeter No. 582 for 7# generator installed at the transformers for auxiliary electricity consumption of 1# and 7# generators by DCS, and automatically recorded per hour.

QA/QC procedures to be applied:	Electricity generation and auxiliary electricity consumption are used to ensure the consistency.

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity supplied by the project in year y
Source of data to be used:	Calculation (according to ACM0004,ver02)
Description of measurement methods and procedures to be applied:	Calculated as follows: $EG_y = EG_{gen} - EG_{AUX}$
QA/QC procedures to be applied:	Electricity generation and auxiliary electricity consumption are used to ensure the consistency.

Data / Parameter:	Q_i
Data unit:	m^3
Description:	volume of the auxiliary fuel i
Source of data to be used:	Obtained from continuously measurement.
Description of measurement methods and procedures to be applied:	Continuously measured by gas flow meter at the intake pipe and monthly recording by the project owner.
QA/QC procedures to be applied:	Double checked against fuel purchase record.

3.3 Monitoring Plan

The monitoring plan focused on monitoring the net electricity supply and the consumption of auxiliary fuel gas of the proposed project.

The electricity data was measured continuously by computer system. For people who are in charge of recording data, they saved the electric copies of daily operation log and made daily log according to the readings. And the auxiliary fuel consumption was recorded according to the reading of flow meters by staff. The daily log was checked by team manager to ensure the accuracy. At 25^{th} of each month, the person in charge of statistic work made monthly operation report based on the daily log. The monthly report was then checked by person in charge of QA/QC to ensure the accuracy. Besides data recording, emergency log and operation time of generators, the reason for the shut down of generators were also recorded in the monthly report.

The electricity sold to Weiyuan Steel Ltd. was checked by both Weiyuan Steel Ltd. and Chuanwei staff, and sales receipts were kept to do cross check with the monthly report.

The daily log, monthly report and monthly sales receipts or other data reports that are associated with emission reductions calculation were kept for the verification.

The measurement precision of the ammeters employed by the proposed project is deployed according to the natural standards, such as DLT 448-2000. Calibration of meters was implemented according to the supply agreement of high voltage electricity of the Project once a year. And all the records were documented and maintained by the project owner for DOE's verification.

In the substation side, four meters, No. 654, No. 655, No. 651, and No. 652, are installed to record the electricity exported from 4 bus bars in the power plant, therefore, the sum of the four meters is the total net electricity exported by the whole power plant (including 7 generators), which is the data source of the invoice record. At the power plant side, meters No. 501 and No. 502 are installed separately to measure the electricity generated and self-used by 1# generator, meters No.581 and No. 582 are installed separately to measure the electricity generated and self-used by 7# generator.

No. 583 and No. 503 are installed at the project power plant and not use to monitor the 1# and 7# net electricity generation, respectively. According to the description in the PDD, meters No.503 and No. 583 are used to monitor the net electricity exported. In actual situation, the net electricity exported is monitored by other 4 meters include No. 651, No. 652, No. 654 and No. 655 with same accuracy requirement installed in the substation. The data for those meters is the invoice records, which is the net electricity exported. In addition, the power plant has 5 other generators named as generators 2# to 6#, and the electricity exported by those 5 generators are billed together with the 1# Generator and 7# generators. So in the substation there have four meters that act as the function described in the PDD for No. 503 and No. 583. And the sum of readings from the four meters, No. 654, No. 655, No. 651, and No. 652, is the net electricity exported by the power plant, which is the source of the invoice data. The invoice record is used to cross check the electricity data in monthly report for the 7 generators.

All meters in the substation side and power plant side are calibrated annually. All the documents are documented.

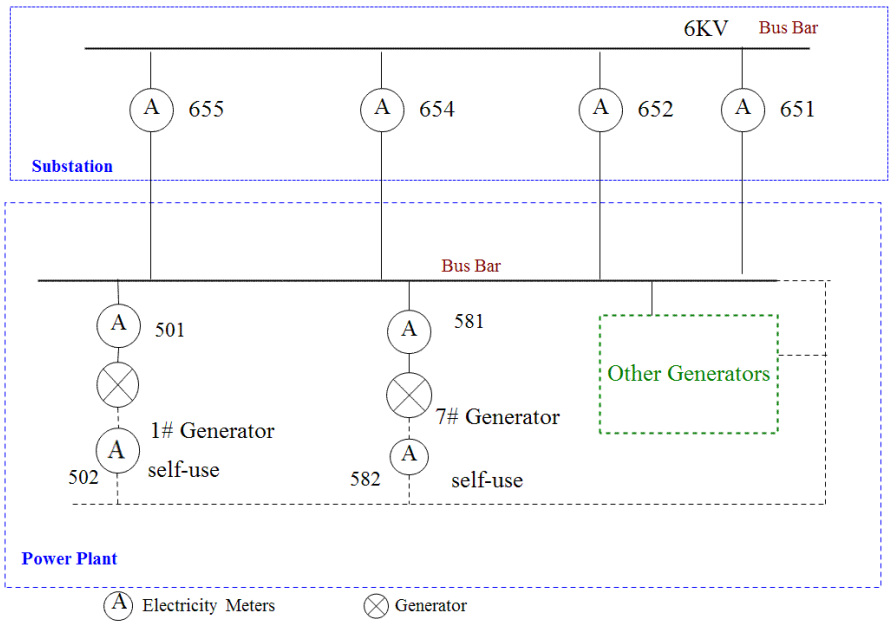

Figure 3-1 Meter diagram of the proposed project

Table 3-1 Meter equipments in the proposed project

Meters No.	Description	Precision	Calibration Frequency
No. 501	Record the electricity generated by #1 generator	1.0s	annually
No. 581	Record the electricity generated by #7 generator	1.0s	annually
No. 502	Record auxiliary power consumed by #1 generator	1.0s	annually
No. 582	Record auxiliary power consumed by #7 generator	1.0s	annually
No. 651, No. 652, No. 654, No. 655	Installed at the substation side. The sum of the four meters is the net electricity exported by the 7 generators	1.0s	annually
	For 2#-6# generators, each generator has two meters, one records the electricity generated, the other one records the auxiliary power consumed	2.0s	annually

The auxiliary fuel consumption is supplied by the gas sector of Chuanwei Group to the power plant where the project is located. The flow meter N1 is used to monitor the total natural gas supplied to the plant (1-7 generators). And flow meter C1 is used to monitor the total COG gas supplied to the plant (1-7 generators). And in the power plant, the 7# generator has its own flow meters: flow meter N2 is used to monitor the natural gas consumed by 7# generator and flow meter C2 is used to monitor the COG consumed by 7# generator.

The four flow meters are calibrated periodically by qualified third party. All records were documented by the project owner. As N1 and C1 record the whole consumption, the readings of N1 and C1 are used in the project emission calculation.

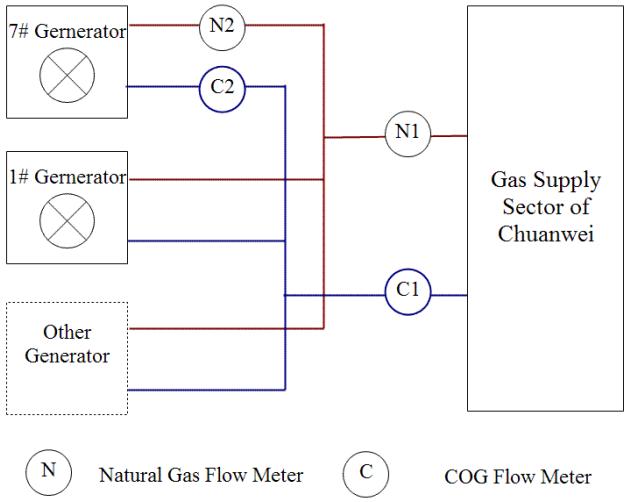

Figure 3-2 Flow meter diagram of proposed project

If ammeters fail during operation period, actual net electricity supply by the Project can not be determined directly from ammeters' readings. In such case, the actual net electricity supply by the Project should be determined with reference to the calibration result and etc. according to the *Rules of Supplying Electricity Business*.

4. GHG Calculations

4.1 Project Emissions

Small amount of auxiliary fuel gases are consumed for start-up of the proposed project and as the fuels for the constant flare point which is distributed in the boiler to prevent uneven combustion of BFG. During the monitoring period, small amount of surplus coke oven gas (COG) and natural gas were used as auxiliary fuels. So the project emission is from combustion of COG and natural gas.

Project emissions are calculated according to the consolidated baseline methodology ACM0004 with equation (1):

$$PE_y = \sum_i Q_i \times NCV_i \times EF_i \times \frac{44}{12} \times OXID_i \qquad (1)$$

Where:

PE_y is the project emissions in year y (tCO_2e)

Q_i is the mass or volume unit of fuel I consumed (t or m^3)

NCV_i is the net calorific value per mass or volume unit of fuel i (TJ/t or m^3),

EF_i is the carbon emissions factor per unit of energy of the fuel i (tC/TJ)

OXID i is the oxidation factor of the fuel i.

Value of each parameter of COG is shown below:

Parameter	Unit	Value	Source
NCV_i	TJ/ m^3	1.7981×10^{-5}	Page 287, China Energy Statistical Yearbook 2007,Higher calorific value
$OXID_i$	%	100	2006 IPCC Guidelines for National Greenhouse Gas Inventories
EF_i	tCO_2e/TJ	44.4	2006 IPCC Guidelines for National Greenhouse Gas Inventories

Value of each parameter of natural gas is shown below:

Parameter	Unit	Value	Source
NCV_i	TJ/ m^3	3.8931×10^{-5}	Page 287, China Energy Statistical Yearbook 2007
$OXID_i$	%	100	2006 IPCC Guidelines for National Greenhouse Gas Inventories
EF_i	tCO_2e/TJ	56.1	2006 IPCC Guidelines for National Greenhouse Gas Inventories

For the proposed project, the auxiliary gas was supplied by the gas supply sector of Chuanwei Group. As described in Section 3.3, the gas supply sector use flow meter N1 and flow meter C1 to record the amount of auxiliary gases supplied to the power plant. For conservative, during the monitoring period, the total amount of natural gas and COG consumed by the whole power plant was used in the project emission calculation.

4.2 Leakage

According to the consolidated baseline methodology ACM0004, no leakage is considered, therefore, L_y =0.

4.3 Baseline emissions

Baseline emissions are calculated as follows:

$BE_y=EG_y*EF_y$

Where:

BE_y is the baseline emissions during the year y (tCO_2e)

EG_y is the net electricity supplied by the project during the year y (MWh).

EF_y is the baseline emission factor (tCO_2e/MWh). According to the calculation in the PDD, the value is $0.97505tCO_2e/MWh$

For the project, the baseline emissions calculation is based on the monthly report of the power plant. Net electricity exported is calculated as follows:

Electricity exported = Electricity exported 1# Generator + Electricity exported 7# Generator
= (meter No. 501— meter No. 502) + (meter No. 581—meter No. 582)

As the invoice only records total electricity generated by 7 generators, the power loss for Generator 1# and Generator 7# can not be calculated individually, to be conservative, all the power loss for 7 generators is deducted in the calculation. The total power loss is calculated as follows:

Total power loss = monthly reports (reports of 7 generators in power plant)—Invoice record (Based on readings of meter No. 654, No. 655, No. 651, and No. 652 in the substation.)

And for the project, the monthly report of Generator 1# and Generator 7# is made on 25th of each month as described in section 3.3. In the calculation of baseline emission for January 2007, the monthly report records the data for Dec 26th 2006 to Jan 25th 2007. The electricity generated from Dec 26th to Dec 31st, 2006 is deducted from the monthly report using the daily log. And to be conservative, all auxiliary fuel consumption during Dec 26th 2006 to Jan 25th 2007 is included. In the calculation for the period of 26th Aug to 09th Sep, 2008, the daily log is used, and to be conservative, all auxiliary fuel consumption during 26th Aug to 25th Sep are included in the project emission calculation.

Although total electricity can be cross checked, the data of Generator 1# and Generator 7# can not be cross checked individually, so when calculated the electricity exported, the data will deduct according to the meter accuracy maximal error range. And during the monitoring period, the electricity generated was read through meters with precision of 1.0s. But in the approved project PDD, the precision of meters are 0.5s. For conservative, the precision difference was considered. For detailed calculation equation, please refer to Annex 1.

4.4 Emission Reductions

The emission reductions by the project activity during the year y are calculated as follows:

$ER_y = BE_y - PE_y$

Where:

ER_y is the emissions reductions of the project activity during the year y (tCO_2e)
BE_y is the baseline emissions due to displacement of electricity during the year y (tCO_2e)
PE_y is the project emission during the year y (tCO_2e)

Brief calculation process and electricity data please see section below. For detailed data and all raw data from Chuanwei, please refer to the attached spreadsheet.

Annex 1

Equation used in the emission calculation:

Equation for electricity deduction (meter precision: 1.0s):
Modified electricity generated = electricity generated (meter No. 501 and No. 581)*(1-2.0%)
Modified auxiliary electricity consumption = auxiliary electricity consumption (meter No. 502 and No. 582)*(1+1.0%)

Total power loss (Period: Jan 2007 to Sep 2008):

Total power loss = monthly record (1#-7# generators) – Invoice record (1#-7# generators)

Net electricity exported:

Net electricity exported1# = Modified electricity generated (meter No. 501) –Modified auxiliary electricity (meter No. 502) – total power loss
Net electricity exported 7# = Modified electricity generated (meter No. 581) –Modified auxiliary electricity (meter No. 582)

The calculation result is shown in the Table 4-1 below. For raw data, please refer to the attached calculation sheet.

Table 4-1 The monitoring data from 01/01/2007 to 09/09/2008*

Period		Net electricity exported1#(MWh)	Net electricity exported7#(MWh)	Net electricity exported(MWh)**	Natural gas consumed (m3)	COG consumed (m3)
		1# generator	7#generator	EG y =1#generator+7#generator	Q	
2007	January	3422.226	5193.788	8,616.01	31338	1,381,044
	February	5552.640	4985.364	10,538.00	65739	1,378,432
	March	6772.206	5465.111	12,237.32	24824	1,158,436
	April	7341.968	6852.275	14,194.24	102350	1,759,970
	May	7328.184	6705.966	14,034.15	85397	1,630,684

	June	7759.992	6667.820	14,427.81	74827	1,647,483
	July	7404.651	4260.723	11,665.37	64007	1,560,793
	August	7757.131	6991.280	14,748.41	106,480	1,807,027
	September	6013.218	6949.064	12,962.28	31,801	1,318,115
	October	7414.081	6921.241	14,335.32	114,151	1,212,105
	November	6954.496	7270.883	14,225.38	22,116	1,497,454
	December	7522.094	7187.353	14,709.45	18,541	1,775,994
2008	January	7552.326	7247.822	14,800.15	108,255	1,941,936
	February	7067.767	6128.811	13,196.58	56,346	1,057,766
	March	6619.822	6752.666	13,372.49	30,586	1,112,073
	April	7054.330	7395.701	14,450.03	23,601	1,441,845
	May	5355.936	5781.762	11,137.70	51,512	1,385,902
	June	7132.108	7078.291	14,210.40	25,238	1,179,505
	July	6822.894	6770.586	13,593.48	18,133	1,139,170
	To 25th Aug	6709.342	5695.106	12,404.45	27,557	904,275
	26th Aug~09th Sep	2801.712	3097.043	5,898.76	38,226	987,262
	Total	138,359	131,399	269,758	1,121,025	29,277,271

* Only listed the data after calculation. For raw data, please refer to the attached excel file 'Raw data and ER calculation for Chuanwei_4'

Therefore, emission reductions are calculated as follows:

1) Baseline emission

$BE_y = EG_y * EF_y = 269{,}758 MWh * 0.97505\ tCO_2/MWh = 263{,}027 tCO_2e$

2) Project emission

For the combustion of natural gas:

$PE_{y,1} = Q*NCV*OXID*EF_i = 1{,}121{,}025\ m^3 * 3.8931\times10^{-5}\ TJ/\ m^3 * 100\% * 56.1\ tCO_2/TJ = 2{,}448\ tCO_2e$

For the combustion of COG:

$PE_{y,2} = Q*NCV*OXID*EF_i = 29{,}277{,}271\ m^3 * 1.7981\times10^{-5}\ TJ/\ m^3 * 100\% * 44.4\ tCO_2/TJ = 23{,}374\ tCO_2e$

So the project emissions are:

$$PE_y = PE_{y,1} + PE_{y,2} = 2{,}448 + 23{,}374 = 25{,}822\ tCO_2e$$

3) Emission reductions

$$ER_y = BE_y - PE_y = 263{,}027\ tCO_2e - 25{,}822\ tCO_2e = 237{,}205\ tCO_2e$$

The result of the calculation is summarized in below table:

Monitoring Period	**Emission reduction (tCO_2e)**
01/01/2007 – 09/09/2008	237,205