THE 1ST MONITOING REPORT OF

THE HYUNDAI STEEL WASTE ENERGY COGENERATION PROJECT

Document Prepared By CERPD Inc.

Project Title	Hyundai Waste Energy cogeneration Project
Version	Version 1
Report ID	786-1
Date of Issue	23 April 2012
Project ID	786
Monitoring Period	24-March-2010 to 31-December-2011
Prepared By	CERPD Inc.
Contact	1420 156th AVE NE Ste H, Bellevue, WA, USA 98007

Table of Contents

1 PROJECT DETAILS

1.1 Summary Description of Project

The Hyundai Waste Energy Recovery Co-generation Project (hereafter referred in this document as the 'proposed project') is a 400MW cogeneration plant at Dangjin Hyundai Steel Mill, which is developed by Hyundai Green power CO., Ltd(hereafter referred in this document as the 'project owner').

The project utilizes surplus waste gases including BFG(Blast Furnace Gas), COG(Coke Oven Gas) and LDG(Converter Gas) produced by Dangjin Hyundai Steel Mill, to generate electricity. The waste gases created by Dangjin Hyundai Steel Mill are reused by the steel mill and the rest are consumed by the proposed project. Without the proposed project the rest of waste gases are emitted to atmosphere after incineration. And the electricity generated by the project is supplied to the grid.

The Project has significant benefits:

- Energy saving (recycling) by using waste energy,

- Using local energy as opposed to importing energy from foreign countries,

- Reducing environmental pollution, and meeting the current environmental policies of South Korea.

Additionally, the project is innovative in that it differs from the traditional thermal electricity generation process, as it uses a high efficiency compound generation system decreasing the amount of imported fuel and reducing emissions by approximately 1,774,699 tCO_2e/year.

1.2 Sectoral Scope and Project Type

The project activity pertains to sectoral scope 1 (Energy industries (renewable / non-renewable) & 4 (Manufacturing industries)

1.3 Project Proponent

Project Owner, Hyundai Green power CO., Ltd:
Donggug Kim, energy management team
zugglae@hotmail.com

Co-project proponent, Hyundai Steel Mill CO., Ltd
Dongkuk.kim@hyundai-steel.com

1.4 Other Entities Involved in the Project

The project's proponent is its developer: CERPD Inc.
Jongbum Kim, Ph.D. CEO, 1420 156th AVE NE Ste H, Bellevue, WA, USA 98007
jbk@cerpd.com

1.5 Project Start Date

- Project start date[1] : March 24, 2010

1.6 Project Crediting Period

- Project crediting period: 10 years (March. 24, 2010 ~ March. 23, 2020),
- The 1st monitoring period is from March, 24, 2010 to December, 31, 2011

1.7 Project Location

The project is located in Donggok-ri Songsan-myeon Dangjin-gun Chungchongnam-do, Republic of Korea. The geographical coordinates are126°42'11.60" E, 36°58'58.27" N. The maps show below the location of the project activity.

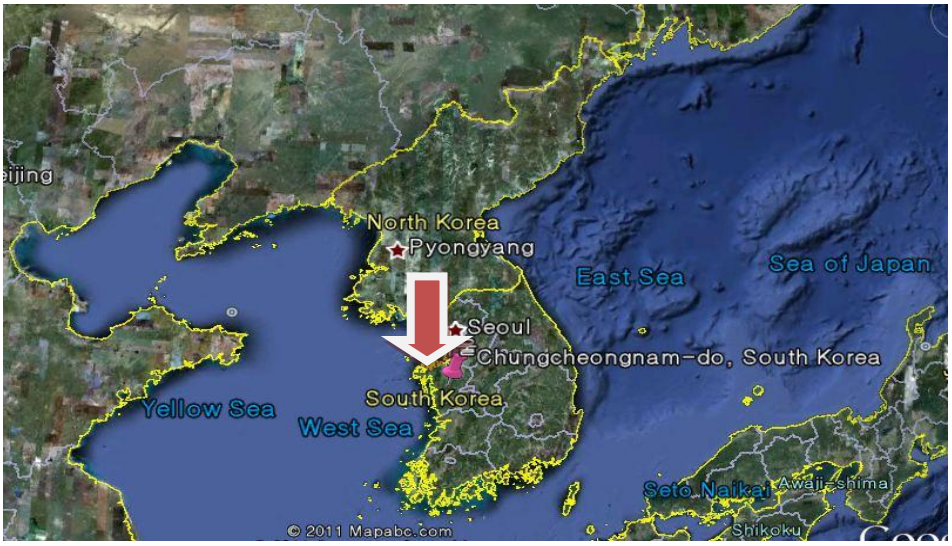


Figure 2. The location of the Chungchongnam province in Republic of Korea

[1] The construction period of the Project was from April 23,2008 to December 10,2010 and the date on which the Project began reducing GHG emissions by commercial operation was March 24,2010.

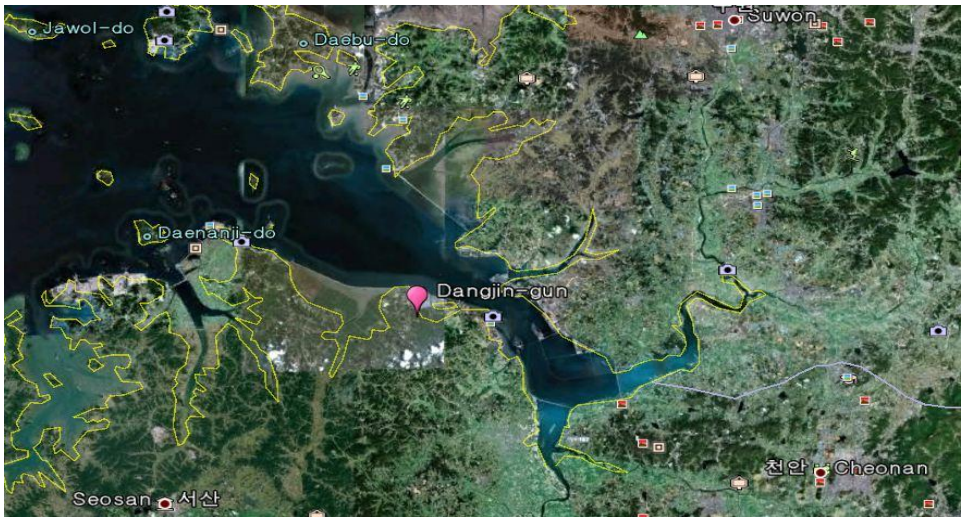


Figure 3. The location of Dangjin county in Chungchongnam Do

Figure 4. The proposed Project in Dangjin county

1.8 Title and Reference of Methodology

(a) The proposed project applies the following approved methodology for PD preparation:

Version 4.0.0 of ACM 0012: "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects" which was approved on the EB's 60th meeting and detailed information refers to
http://cdm.unfccc.int/methodologies/DB/L731WMCXLT0WE6ALG5AYAGLTJP7KW7

(b) The tools drawn upon from Version 4.0.0 of ACM0012 are:

Version 02.2.1 of the tool to calculate the emission factor for an electricity system; detailed

information refers to: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

Version 5.2 of the tool for the demonstration and assessment of additionality; detailed information refers to: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.1.pdf

Version 01 of "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" detailed information refers to: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf

Version 02 of "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", detailed information refers to: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The project activity started on 24 March, 2010, and exported 4,355,731 MWh of electricity to the grid during the 1st monitoring period. The 1st monitoring period is from 24 March, 2010 to 31, Dec, 2011.

Timeline of the project implementation status is described below.

Activity	Data
Start of construction	April, 23 ,2008
#1 turbine Commissioning	November, 23, 2009
#2 turbine Commissioning	December, 12, 2010
#3 turbine Commissioning	August, 04, 2010
#4 turbine Commissioning	September, 17, 2010
#1, #2 Commercial operation	March, 24, 2010
#3, #4 Commercial operation	October, 31, 2010

During the 1st monitoring period, generators were stopped several times, caused by operational reasons.

<Outage Status of generators>

Generator	Date	Reason
generator #1	7,May, 2011	misoperation of FDF Inlet Vane

generator #3	27, Sep, 2011	Tank Level decreased while switching CCW H/E
generator #3,4	15, Mar, 2011	communication module error of ICMS OPC
generator #1	28, Jun, 2011	BFP-B Shaft broken
generator #1	21, Jul, 2011	Breakaway of BFG pipe from Sliding Support
generator #3	20, Jul, 2011	condenser flooded (Rupture Disc damaged)

When the generators stopped, the supply of waste energy will also be stopped. So there is no waste gas released during the instances of shut down or other abnormal operation

2.2 Deviations from the Monitoring Plan

1. According to the monitoring plan in the VCS PD, the quantity of electricity consumed by the project electricity consumption ($EC_{PJ,y}$), would be measured by standard meter continually. However, there is no standard meter for measuring electricity consumed in actual operation.

In this monitoring report, the amount of electricity consumption of booster fan was calculated with the default value of manufacture's specification. (For conservative approach, it was calculated with the assumption of full operation for the whole year)

<Calculation for the electricity consumption of booster fans>

(1) 2 FANS for COG and BFG
450kW X2set X 24hr X 365 days = 7,884,000 kWh/yr

(2) Fan for LDG
240kW X 24hrs X 365days = 2,102,400 kWh/yr

The amount of electricity consumption of booster fan is 9,986,400 kWh for a year. Therefore, total amount of the electricity consumption of booster fan is 18,308,400 kWh for the 1st monitoring period.

2. According to the monitoring plan in the VCS PD, the power generation data will be monitored and collected by EMS-IRTV system. Also, the data collected by EMS-IRTV will be sent to Korea Power exchange for the purchase of electricity and will be stored for 2 years. However, EMS-IRTV will be stored for only 6 months. The main purpose of EMS-IRTV is to check if there is any errors in Korea Power Exchange data whose the invoice for electric generation being provided is just for the evidence of metered data because the invoiced data is more reliable.

2.3 Grouped Project

Not Applicable.

This is not a grouped project activity.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data Unit / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO_2/MWh
Description:	Operating Margin emission factor
Source of data:	calculated
Value applied:	0.7224 tCO_2 /MWh
Purpose of the data:	The data was used for calculating $EF_{y.}$
Any comment:	The value numbers were calculated around the time of the submission of the PD and would not change during the accreditation period.

Data Unit / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO_2/MWh
Description:	Build Margin emission factor
Source of data:	calculated
Value applied:	0.6059 tCO_2 /MWh
Purpose of the data:	The data was used for calculating $EF_{y.}$
Any comment:	The value numbers were calculated around the time of the submission of the PD and would not change during the accreditation period.

Data Unit / Parameter:	EF_y
Data unit:	tCO_2/MWh
Description:	Carbon emission factor of Korea National power grid
Source of data:	calculated
Value applied:	0.6641 tCO_2/MWh

Purpose of the data:	The data was used for calculating carbon emission in accordance with electricity use.
Any comment:	The value numbers were calculated around the time of the submission of the PD and would not change during the accreditation period.

Data Unit / Parameter:	$COEF_{j,y}$
Data unit:	kgCO2/TJ
Description:	Weighted average CO2 emission factor of fuel type i in year y
Source of data:	IPCC2006
Value applied:	54,300
Purpose of the data:	-
Any comment:	-

Data Unit / Parameter:	$TDL_{j,y}$
Data unit:	-
Description:	Average technical transmission and distribution losses for providing electricity to source j in year y.
Source of data:	Tool to calculate baseline, project and/or leakage emissions from electricity consumption.
Value applied:	20%
Purpose of the data:	To calculate electricity provided considered with transmission and distribution loss.
Any comment:	-

Data Unit / Parameter:	NCV_i (for EF_{grid} calculation)
Data unit:	kcal/l, kcal/kg
Description:	Net calorific value for fuel consumed in OM power plants.
Source of data:	STATISTICS OF ELECTRIC POWER IN KOREA(2007,2008,2009)

Value applied:	See attachment EF_{grid} calculation
Purpose of the data:	The data was used for calculating EF_{grid}
Any comment:	-

3.2 Data and Parameters Monitored

Data Unit / Parameter:	$EG_{j,y}$
Data unit:	MWh
Description:	Quantity of electricity supplied to the grid by the project activity during the year *y.*
Source of data:	Measurement records
Description of measurement methods and procedures to be applied:	Direct measurement by project participants through standard meter continually. The data source are from the utility invoice
Frequency of monitoring/recording:	The electricity generation amount is monitored continuously and record every day.
Value monitored:	4,355,731.01
Monitoring equipment:	Main meter M1 Type : 3P4W110V5A Accuracy class : 0.2s Serial number : PT-0808A177-01 Main meter M2 Type : 3P4W110V5A Accuracy class : 0.2s Serial number : PT-0808A177-01 Main meter M3 Type : 3P4W110V5A Accuracy class : 0.2s Serial number : PT-0808A176-01 Main meter M4 Type : 3P4W110V5A Accuracy class : 0.2s Serial number : PT-0808A178-01

	Backup meter M5 Type : 3P4W110V5A Accuracy class : 0.5s Serial number : 51001402 Backup meter M6 Type : 3P4W110V5A Accuracy class : 0.5s Serial number : 51001399 Backup meter M7 Type : 3P4W110V5A Accuracy class : 0.5s Serial number : 51001400 Backup meter M8 Type : 3P4W110V5A Accuracy class : 0.5s Serial number : 51001398
QA/QC procedures to be applied:	The amount of power generation is crosschecked with the receipt. The meters are calibrated every 3.5 years. First date of calibration for the meters was 17/11/2008. During this monitoring period, the meters need no calibration.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	$EC_{PJ,y}$
Data unit:	MWh
Description:	Quantity of electricity consumed by the project electricity consumption source j in year y.
Source of data:	Designed value
Description of measurement methods and procedures to be applied:	Calculation with the designed data

Frequency of monitoring/recording:	-
Value monitored:	18,308.4
Monitoring equipment:	Due to the absence of electricity meters of facilities that consumed electricity for the project activity, designed value was applied for calculating the amount of electricity consumption.(with the assumption of full operation for the year.(24hrs a day, 365days a year))
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	$AF_{i,j,y}$
Data unit:	Nm^3
Description:	LNG consumed on-site for power generation.
Source of data:	Measurement records.
Description of measurement methods and procedures to be applied:	Direct measurement by project participants through standard flow meter continually.
Frequency of monitoring/recording:	Direct measurement by project participants through standard meter continually. The data is displayed by DCS with accumulated flow; the amount of LNG consumption is reported every month
Value monitored:	8,925,949
Monitoring equipment:	
QA/QC procedures to be applied:	The meters would be calibrated by LNG supplier when the meter is at abnormal condition.

Tag No.	FQIT-01	FQIT-02
Model	SM-RI-X	SM-RI-X
Flow rate	773~24,477 Nm3/h	773~24,477 Nm3/h
Accuracy	±1.0%	±1.0%
Type	Oil pump type	Oil pump type

Calculation method:	-
Any comment:	-

Data Unit / Parameter:	NCV_i (for $AF_{i,j,y}$ calculation)
Data unit:	TJ/Gg
Description:	Net calorific value for fuel LNG
Source of data:	IPCC 2006[2]
Description of measurement methods and procedures to be applied:	IPCC default values at the upper limit of the uncertainty at a 95% according to "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion".
Frequency of monitoring/recording:	-
Value monitored:	50.4
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	The value will be upgraded when the value in IPCC changed.

Data Unit / Parameter:	$EF_{CO2,i,y}$
Data unit:	Nm^3
Description:	CO2 emissions factor for LNG.
Source of data:	Measurement records.
Description of measurement methods and procedures to be applied:	IPCC default values at the upper limit of the uncertainty at a 95% according to "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion".
Frequency of monitoring/recording:	-
Value monitored:	58,300
Monitoring equipment:	-
QA/QC procedures to be applied:	-

[2] The NCV_i is used only in calculating project emission caused by LNG consumption. And in the calculation for EFOM and EFBM, the specific NCV of LNG for each power plant was adopted.

Calculation method:	-
Any comment:	The value will be upgraded when the value in IPCC changed.

Data Unit / Parameter:	Energy balance of Hyundai Steel Mill
Data unit:	-
Description:	Energy balance of Hyundai Steel Mill including all the internal use of waste gas and waste gas send to Hyundai Greenpower
Source of data:	Measurement records.
Description of measurement methods and procedures to be applied:	Related data directly measured by project participants through standard meter continually. And, the data can be monitored by DCS.
Frequency of monitoring/recording:	Monthly, aggregated annually
Value applied:	-
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	As shown in Section 5, there is no decrease in the energy recovery of WECM(s) in the extended boundary excluding the project WECM.

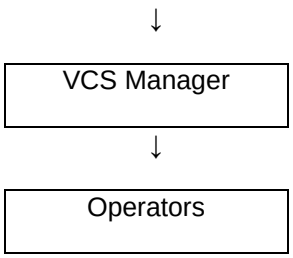
3.3 Description of the Monitoring Plan

1. Allocation of project management

The Engineering Team at Hyundai Green Power plant is responsible for the monitoring plan of the proposed project. The team manages the measurement and record of all data and the maintenance of equipment associated with the project. Operators under the Engineering Team are composed to implement the accurate monitoring, and are assigned to the task of monitoring as follows;

<VCS Team>

Head of Energy P/T



	Tasks
Head of Energy P/T	-Cross-check and management of monthly an annual data related to ER calculation. - Check the annual emission reduction and approve the monitoring report.
VCS Manager	- Check and verification of monthly and annual data related to ER calculation. - Calculation of annual GHG emissions reduction and documentation of monitoring report, and report to Head of Energy P/T.
Operator	Operation of facilities and logging. - Logging and record of daily data related to ER calculation. - Maintenance and management of meters. - report to VCS manager every month about the monitored data.

All of the team members are from Hyundai Green Power and Hyundai Steel Mill. A head of Energy P/T and the VCS Manager who are from Hyundai Green Power are mainly in charge of the monitoring for the proposed project. Some of the operators are from Hyundai Steel mill who are in charge of providing the data of electricity consumed in the proposed project.

All monitored data is kept during the crediting period and 2 years after the end of crediting period.

2. Management and operational system

2.1 Data collection and storage

For power generation, the data is monitored and collected by the Korea Power exchange for the sales of electricity and will be stored for 2 years after the end of the project crediting period.

For LNG consumption, the data is displayed by DCS with accumulated flow; the amount of LNG consumption is reported every month and will be stored for 2 years after the end of the project

crediting period.

2.2 Cross checking

The amount of power generation and LNG consumption is crosschecked with the receipt, if there is any deference between monitored data and receipt, the reason of the deference must be found out. If it cannot be found out, for conservative consideration, the data leading to lower Emission Reductions will be used for calculation.

2.3 Training

Internal training is provided to operational staff to enable them to undertake the tasks required by the monitoring plan and to share the latest information on relevant laws and regulations.

3. Procedures for handling internal auditing and non-conformities

Internal auditing procedures are followed after the data were collected and the emission reduction was calculated. The procedures of internal auditing are as follows:

(a) Set up an internal audit team, the team members are mainly consisted by the VCS team

(b) Set up an internal auditing plan, the main process of the internal auditing is to check the accuracy of the calculation and data collection. Members should not audit the parts which they are in charge of.

(c) If some non-conformities are found, the one who in charge of should be informed and be ordered to correct

(d) The Emission Reduction calculation and monitoring report should be revised according to the result of the internal auditing.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

According to methodology ACM0012 ver.4.0.0, the baseline emission calculation shall be determined as follows:

$$BE_y = BE_{En,y} + BE_{flst,y} \quad \textbf{(1)}$$

Where:

BE_y	The total baseline emissions during the year *y* in tCO_2.
$BE_{En,y}$	The baseline emissions from energy generated by the project activity during the year *y* in tCO_2.
$BE_{flst,y}$	Baseline emissions from fossil fuel combustion, if any, either directly for flaring of waste gas or for steam generation that would have been used for flaring the waste

gas in the absence of the project activity (tCO_2).

As for the proposed project, there is no fossil fuel combusted for flaring the waste gas in the absence of the proposed project. So $BE_{flst,y}=0$.

1. Baseline emissions from energy generated by the project activity ($BE_{En,y}$).

According to the methodology BE_y of The proposed project should be calculated as follows

$$BE_{En,y} = BE_{Elec,y} + BE_{Ther,y} \quad \textbf{(2)}$$

Where:

$BE_{Elec,y}$	Baseline emissions from electricity during the year *y* in tCO_2.
$BE_{Ther,y}$	Baseline emissions from thermal energy (due to heat generation by elemental processes) during the year *y* (tCO_2).

(a) Baseline emissions from electricity ($BE_{Elec,y}$) generation.

$$BE_{Elec,y} = f_{cap} * f_{wcm} * \sum_j \sum_i (EG_{i,j,y} * EF_{Elec,i,j,y}) \quad \textbf{(3)}$$

Where:

$BE_{elec,y}$	Baseline emissions due to displacement of electricity during the year *y* (tCO_2)
$EG_{i,j,y}$	The quantity of electricity supplied to the recipient *j* by generator, which in the absence of the project activity would have been sourced from source *i* (the grid) during the year *y* in MWh.
$EF_{elec,i,j,y}$	The CO_2 emission factor for the electricity source *i* (gr for the grid), displaced due to the project activity, during the year *y* (tCO_2/MWh).
f_{wcm}	Fraction of total electricity generated by the project activity using waste energy. This fraction is 1 if the electricity generation is purely from use of waste energy.
f_{cap}	Factor that determines the energy that would have been produced in project year *y* using waste energy generated at a historical level, expressed as a fraction of the total energy produced using waste source in year *y*. The ratio is 1 if the waste energy generated in project year *y* is the same or less than that generated at a historical level.

For f_{wcm} *calculation of* the project, calculating f_{wcm} is not available due to technical constraints; the emissions due to auxiliary fossil fuel combusted will be calculated in project emission according to ACM0012 ver04 equation 41.

As the project is a Greenfield power plant, f_{cap} of this project is 1.

For this project, the power is exported to the grid, so $EF_{elec,i,j,y}$= $EF_{elec,gr,j,y,}$. The CO_2 emission factor of the electricity $EF_{elec,gr,j,y}$ was calculated following the guidance provided in the "Tool to calculate the emission factor for an electricity system".

The result of $EF_{elec,i,j,y}$ *is 0.6641*(tCO2/MWh).

(b) Baseline emissions for generation of thermal energy ($BE_{ther,y}$) and steam-generated mechanical energy

This project doesn't claim GHG emission reductions from thermal energy for conservative, so this step is skipped.

Calculation of Baseline emission reductions:

$$BE_y = BE_{En,y} + BE_{flst,y}$$

$$= BE_{Elec,y} + BE_{Ther,y} + BE_{flst,y}$$

$$= f_{cap} * f_{wcm} * \sum_j \sum_i (EG_{i,j,y} * EF_{Elec,i,j,y}) + BE_{Ther,y} + BE_{flst,y}$$

= 1×1× 4,355,731 MWh×0.6641 tCO_{2e}/MWh+0+0

= 2,892,641 (tCO2e)

Detail information for calculation of Baseline Emission calculation can be found in the excel file attachment of "1st_ER calculation sheet".

4.2 Project Emissions

Project Emissions include emissions due to (1) combustion of auxiliary fuel to supplement waste gas/heat, and (2) electricity emissions due to consumption of electricity for cleaning of gas before being used for generation of energy or other supplementary electricity consumption.

$$PE_y = PE_{AF,y} + PE_{EL,y} \quad \textbf{(4)}$$

Where:

PE_y	Project activity emissions from on-site consumption of fossil fuels by the unit

process(es) and/or co-generation plant(s) if they are used as supplementary fuels

$PE_{AF,y}$ emissions from on-site consumption of electricity for gas cleaning equipment or other supplementary electricity consumption (tCO2) (as per Table 1: Summary of gases and sources included in the project boundary)

$PE_{EL,y}$ The total project emissions during the year y

In this project, although LNG is not used for the purpose of generation, LNG is used for sparking when starting up and in case the NCV of waste gas is too low to burn. The emission due to consumption of LNG was calculated according to latest approved tool "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion".

According to the tool CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$\mathrm{PE}_{\mathrm{AF,y}} = \sum_i AF_{project,i,y} * NCV_i * EF_{AF,i} \quad \textbf{(5)}$$

= 6.38 Gg X 50.4 TJ/Gg X 58,300kgCO2e/TJ

= 18,734(tCO2e)

Where:

$AF_{product\ plant,l,j}$ LNG consumed on-site for power generation

NCV_i Net calorific value for fuel LNG

$EF_{AF,i}$ Carbon dioxide emissions factor for LNG

$PE_{AF,y}$ Project activity emissions from on-site consumption of fossil fuels by the unit process(es) and/or co-generation plant(s) if they are used as supplementary fuels

As for $PE_{EL,y}$, according to Methodology ACM0012, project emissions due to electricity consumption of gas cleaning equipment or other supplementary electricity consumption are calculated by using latest approved tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

According to the Tool, baseline methodology procedure should be followed: first a generic approach to calculate emissions from consumption of electricity is introduced. Then guidance on the determination of the emission factor for electricity generation is provided. Finally, simplified alternative approaches to the generic approach are introduced. These simplified alternative approaches are only applicable to scenario B and to project and leakage emissions.

Generic approach

According to the tool, the project emissions from consumption of electricity are calculated based on the following formula

$$PE_{EL,y} = \sum_j EC_{PJ,j,y} \times EF_{EL,j,y} \times (1+TDL_{j,y}) \quad \textbf{(6)}$$

= 18,308.4 MWh X 0.6641 tCO2/MWh X(1+0.2)

= 14,590 (tCO2e)

Where:

$PE_{EL,y}$	Project emissions from electricity consumption in year y (tCO2/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

Calculation of Project emission reductions:

As detail described above calculation of emission reductions are calculated as follows

$$PE_y = PE_{AF,y} + PE_{EL,y}$$

$$= \sum_i AF_{project,i,y} * NCV_i * EF_{AF,i} + PE_{EL,y}$$

= (6.38 Gg X 50.4TJ/Gg X58,300 kgCO2/TJ) + (18,308.4 MWh X 0.6641 tCO_{2e}/MWh X (1+20%))

= 33,324 (tCO_2e)

Detail information for calculation of Project Emission calculation can be found in the excel file attachment of "ER calculation sheet".

Emission Reduction of the proposed project can be determined as follows

$$ER_y = BE_y - PE_y - LE_y \quad \textbf{(7)}$$

= 2,892,641 tCO_2e/yr - 33,324 tCO_2e/yr – 0

= 2,859,317(tCO_2e)

4.3 Leakage

In accordance with ACM 0012, no leakage is considered.

4.4 Summary of GHG Emission Reductions and Removals

<Summary of GHG Emission Reduction in 2010>

	baseline emissions (tCO_2e)	project emissions from on-site consumption of fossil fuel (tCO_2e)	project emission from Electricity consumption	leakage emissions (tCO_2e)	net GHG emission reductions or removals (tCO_2e)
Mar, 2010	23,959.4	31.08	6,632	0	23,265.1
Apr, 2010	80,603.6	2,346.14		0	77,594.3
May, 2010	90,817.9	2,179.31		0	87,975.4
Jun, 2010	85,657.8	1,458.58		0	83,536.0
Jul, 2010	87,686.4	883.92		0	86,139.3
Aug, 2010	90,280.4	6,227.00		0	83,390.2
Sep, 2010	78,617.5	1,184.30		0	76,770.0
Oct, 2010	87,695.2	1,907.78		0	85,124.2
Nov, 2010	102,926.5	482.40		0	101,780.9
Dec, 2010	166,909.9	299.55		0	165,947.1
Total (tCO2)	895,154.7	17,000.06	6,632	0	871,522.7

<Summary of GHG Emission Reduction in 2011>

	baseline emissions (tCO_2e)	project emissions from on-site consumption of fossil fuel (tCO_2e)	project emission from Electricity consumption	leakage emissions (tCO_2e)	net GHG emission reductions or removals (tCO_2e)
Jan, 2011	171,218.7	261.57	7,958.4	0	170,293.9
Feb, 2011	159,597.6	0.67		0	158,933.7
Mar, 2011	158,456.6	41.96		0	157,751.5
Apr, 2011	152,385.1	527.54		0	151,194.4
May, 2011	157,553.2	172.79		0	156,717.2
Jun, 2011	172,644.5	198.44		0	171,782.8
Jul, 2011	167,931.1	7.32		0	167,260.6
Aug, 2011	175,738.3	27.99		0	175,047.1
Sep, 2011	168,765.9	41.48		0	168,061.2
Oct, 2011	178,038.9	4.98		0	177,370.7
Nov, 2011	169,169.9	176.53		0	168,330.2
Dec, 2011	165,986.6	272.45		0	165,050.9
Total (tCO2)	1,997,486.3	1,733.72	7,958.4	0	1,987,794.2

<Summary of GHG Emission Reduction for the 1st monitoring period >

	baseline emissions (tCO_2e)	project emissions from on-site consumption of fossil fuel (tCO_2e)	project emission from Electricity consumption	leakage emissions (tCO_2e)	net GHG emission reductions or removals (tCO_2e)
Mar, 2010	23,959.4	31.08		0	23,265.1
Apr, 2010	80,603.6	2,346.14		0	77,594.3
May, 2010	90,817.9	2,179.31		0	87,975.4
Jun, 2010	85,657.8	1,458.58		0	83,536.0
Jul, 2010	87,686.4	883.92		0	86,139.3
Aug, 2010	90,280.4	6,227.00		0	83,390.2
Sep, 2010	78,617.5	1,184.30		0	76,770.0
Oct, 2010	87,695.2	1,907.78		0	85,124.2
Nov, 2010	102,926.5	482.40		0	101,780.9
Dec, 2010	166,909.9	299.55		0	165,947.1
Jan, 2011	171,218.7	261.57	14,590.3	0	170,293.9
Feb, 2011	159,597.6	0.67		0	158,933.7
Mar, 2011	158,456.6	41.96		0	157,751.5
Apr, 2011	152,385.1	527.54		0	151,194.4
May, 2011	157,553.2	172.79		0	156,717.2
Jun, 2011	172,644.5	198.44		0	171,782.8
Jul, 2011	167,931.1	7.32		0	167,260.6
Aug, 2011	175,738.3	27.99		0	175,047.1
Sep, 2011	168,765.9	41.48		0	168,061.2
Oct, 2011	178,038.9	4.98		0	177,370.7
Nov, 2011	169,169.9	176.53		0	168,330.2
Dec, 2011	165,986.6	272.45		0	165,050.9
Total (tCO2)	2,892,641	18,733.8	14,590.3	0	2,859,316.9

5 ADDITIONAL INFORMATION

According to the approved methodology ACM0012, if there is a decrease in the energy recovery of WECM(s) in the extended boundary excluding the project WECM, a technical justification along with energy balance should be demanded explaining why the reduction in recovery is not due to the CDM project.

In order to improve there is no decrease in the energy recovery of WECM(s) in the extended boundary excluding the project WECM(s), the comparison of energy balance is as follows;

<The designed energy balance in the VCS PD>

Waste Gas	For Hyundai Greenpower	For alternative uses (Hyundai Steel)	Total
	Percentage	Percentage	Percentage

COG	10.7%	89.3%	100%
BFG	74.7%	25.3%	100%
LDG	100.0%	0.0%	100%
Total	54.3%	**45.7%**	100%

<The actual energy balance in 2010>

Waste Gas	For Hyundai Greenpower	For alternative uses (Hyundai Steel)	Total
	Percentage	Percentage	Percentage
COG	22.9%	77.1%	100%
BFG	51.3%	48.7%	100%
LDG	61.3%	38.7%	100%
Total	42.5%	**57.5%**	100%

<The actual energy balance in 2011>

Waste Gas	For Hyundai Greenpower	For alternative uses (Hyundai Steel)	Total
	Percentage	Percentage	Percentage
COG	24.2	75.8	100%
BFG	56.9	43.1	100%
LDG	19.3	80.7	100%
Total	43.6%	**56.4%**	100%

As described above, the ratio of 'WECM stream for alternative uses' in designed energy balance is 45.7%, and the ratio in actual energy balance in 2010 is 57.5% and the actual energy balance in 2011 is 56.4%. Therefore, there is no decrease in the energy recovery of WECM(s) in the extended boundary excluding the project WECM.