

# VCS VERIFICATION REPORT FOR HYUNDAI STEEL WASTE ENERGY COGENERATION PROJECT



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### Summary:

China Classification Society Certification Company (CCSC), commissioned by CERPD, Inc., has performed the 3<sup>rd</sup> periodic Verification of the Hyundai Steel Waste Energy Cogeneration Project in Donggok-riSongsan-myeon Dangjin-gun Chungchongnam-do, Republic of Korea (hereafter referred to as “the project”), on the basis of requirements of VCS Standard (Version 3.7) /20/.

The Project has been validated by First Environment, Inc.(Validation report /15/ issued on 09/02/2012 ) based on the VCS PD /16/, dated on 14/01/2012. The Project was registered as a VCS project activity on 01 March 2012 under approved CDM ACM0012 (Version 4.0.0) /19/ “ Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects”.

A desk review of documents and an on-site visit have been conducted to verify the data submitted in the monitoring report. CCSC verified the asserted emission reductions against the approved consolidated baseline methodology ACM0012 (Version 4.0.0) “Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects”, on the basis of the VCS Validation and Verification Manual (Version 3.2), as well as criteria given to provide for consistent project operations, monitoring and reporting.

CCSC appointed a qualified verification team in accordance with internal procedures to perform the verification.

In the course of the verification, 1 Clarification Request (CL) and 3 Corrective Action Requests (CARs) were raised and successfully closed.

As a result of this verification, the verification team confirms that:

-All operations of the project are implemented and installed as planned and described in the validated VCS PD;

-The monitoring plan is in compliance with the applied methodology ACM0012 version 4.0.0 "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects" and the actual monitoring has been carried out in accordance with the monitoring plan in the validated VCS PD.

-The monitoring system is in place and functional;

-The installed equipment for measuring parameters required for calculating emission reductions are calibrated appropriately.

Based on the information observed and evaluated, the verification team confirms that the emission reductions are correctly calculated in the MR /1/ (Version 02 dated 06/03/2018).

Therefore CCSC certifies the emission reductions amounting to 5,798,682 tCO<sub>2</sub>e covering the monitoring period from 01/06/2013 to 30/06/2017 (1490 days included) and requests issuance of the equivalent VCUs.

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## 1 INTRODUCTION

### 1.1 Objective

CERPD, Inc. has commissioned CCSC to perform the 3rd VCS verification of greenhouse gas (GHG) emission reductions of the project activity “Hyundai Steel Waste Energy Cogeneration Project” (hereafter referred to as “the Project”) for the period from 01/06/2013 to 30/06/2017, on the basis of requirement of VCS Standard (Version 3.7) and the approved methodology ACM0012 (Version 4.0.0) .

CCSC as the validation/verification body (VVB) of the project has been accredited as a DOE by UNFCCC and also meets the competence requirements as set out in ISO 14065:2007.

The objectives of verification are to:

- a) Ensure that the project activity has been implemented and operated as per the VCS project description (VCS-PD) and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place;
- b) Ensure that the monitoring report and other supporting documents provided are complete in accordance with the latest applicable version of Registration and Issuance Process and in accordance with the additional requirements stated by the VCS Association (VCSA);
- c) Ensure that actual monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan and the approved methodology;
- d) Evaluate the data recorded and stored as per the monitoring methodology.

### 1.2 Scope and Criteria

The verification scope encompasses an independent and objective review and ex-post determination of the monitored reductions in GHG emissions by the CCSC. The verification scope covers the relevant documents (e.g. the VCS-PD, the monitoring plan, the VCS monitoring report (VCS-MR), the emission reduction calculation spreadsheet, supporting documents available to the verifier and information collected through performing interviews and during the on-site assessment, VCSA's requirements publicly available, relevant rules, including the host country legislation, etc.) to be independently reviewed, the project geographical locations to be visited on-site, the related project local stakeholders to be interviewed with, and processes that are necessary to acquire objective evidence for the evaluation of the project compliance to the VCS requirements, CDM approved methodology ACM0012 (Version 4.0.0) and associated interpretations.

The above verification activities are conducted according to the VCSA requirements. In doing so, the principles of accuracy and completeness, relevance, reliability and credibility were followed.

The verification is not meant to provide any consulting service towards the PPs. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project.

### 1.3 Level of Assurance

CCSC has undertaken a reasonable assurance engagement in accordance with VCS Standard (Version 3.7). It requires a reasonable level of assurance in verification that GHG assertions are free of material errors, omissions and misrepresentations. The verification conclusion is based on the VCS-PD, VCS-MR, supporting evidences made available to the verifier and information collected through performing interviews and during the on-site inspection.

### 1.4 Summary Description of the Project

The Hyundai Steel Waste Energy Recovery Co-generation Project is a 400MW cogeneration plant at Hyundai Steel, which is developed by Hyundai Green power CO., Ltd. The project utilizes surplus waste gases sourced from two newly built blast furnace (BF) including BFG (Blast Furnace Gas), COG (Coke Oven Gas) and LDG (Linz Donawitz Gas/converter Gas) produced by Dangjin Hyundai Steel Mill to generate electricity. The waste gases created by Dangjin Hyundai Steel Mill are re-used by the steel mill and the rest (balance) are combusted in the boilers by the proposed project to produce steam, which is returned to Hyundai Steel for use in industrial applications or used to produce electricity exported to national transmission grid. Through this project, approximately 2,741,035MWh electricity will be sent to power grid, and 1,285,000 ton steam will be produced and sent to Steel. And the emission reductions are estimated to be 1,774,699 tCO<sub>2</sub>e per year.

Without the proposed project, the rest of waste gases are emitted to atmosphere after incineration, the electricity generated by the proposed project will be supplied by grid.

The Project is owned by Hyundai Green power CO., Ltd (hereafter referred to as "the PP"), and is located in Donggok-ri Songsan-myeon Dangjin-gun Chungchongnam-do, Republic of Korea. The geodetic coordinates are 126° 42'11.60" E, 36°58'58.27" N.

The Project has been validated by First Environment, Inc.(Validation report issued on 09/02/2012) based on the VCS PD, dated on 14/01/2012 and reported in the validation report version 1 dated 9 February 2012. The Project was registered as a VCS project activity on 01 March 2012 under approved CDM ACM0012 (Version 4.0.0) " Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects".

According to the VCS-MR template, the section1.1 is supposed to include the total GHG emission reductions generated in this monitoring period. Therefore, **CAR1 was raised**. In the revised MR (Version02), it has been confirmed that the total GHG emission reductions has been added. Hence, **CAR1 was closed**.

After verification, CCSC confirms that the total emission reductions during this VCS monitoring period covers from 01/06/2013 to 30/06/2017 inclusive were 5,798,682 tCO<sub>2</sub>e..

## 2 VERIFICATION PROCESS

### 2.1 Method and Criteria

The overall verification, from Contract Review to Verification Report & Opinion, was conducted using CCSC internal procedures.

CCSC verified the project against the requirements set in *VCS Standard (Version 3.7)* and other relevant VCS requirements..

### 2.2 Document Review

A desk review of the VCS-PD,/16/ the validation report, the applied monitoring methodology, VCS monitoring report (VCS-MR) /1/ and supporting documents was conducted by the verification team. The aim of the desk review of the documentation was to verify the completeness of the data and the information presented, to carry out the compliance check of the VCS-MR with respect to the monitoring plan and the applied methodology. Particular attention was given to the frequency of measurements, the quality of the metering equipment including calibration requirements, and the quality assurance and quality control procedures. The evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions was also conducted.

To address the CCSC's corrective action and clarification requests, the VCS-MR /1/ was revised and resubmitted by PP. The final verification conclusion presented in this report is based on the revised VCS-MR /1/ (version02, dated on 06/03/2018).

Section 6 of this report contains a complete list of all documents and proofs reviewed by the verification team.

### 2.3 Interviews

From 25/10/2017 to 26/10/2017, CCSC performed an on-site assessment at the physical site of the project located in Donggok-ri Songsan-myeon Dangjin-gun Chungchongnam-do, Republic of Korea.

The verification team verified that the actual implementation of the project was as described in the VCS-PD /16/ and VCS-MR /1/. This included the review of the project operation based on the evidence of on-site observation and presented documents.

During the on-site assessment, the verification team has interviewed with key personnel from the project owner (the project participant) and the consultancy.

The assessment content and topics/the persons interviewed at the on-site assessment were provided in the below table.

<b>Date: 25/10/2017 to 26/10/2017</b>
---------------------------------------

Interview topics	Interviewed Organizations and persons
<p>--The status of VCS project implementation.</p> <p>-- Any changes of the VCS project.</p> <p>-- The project on-site inspection—The evidences of construction, status and operation of key equipment, parameters monitoring and data processing activities, monitor equipment and calibration.</p> <p>-- Monitoring data.</p> <p>-- Quality Management; organizational structure, responsibilities and competencies. Internal QA/QC Management procedures and document control (QA/QC).</p>	<p>Hyundai Green power CO., Ltd. (the project owner): Woosuk Sung (Team Manager)</p> <p>Junsuk Ahn (Assistant Manager)</p> <p>Kyung soo Jung (Assistant Manager)</p> <p>Hyundai Steel Mill CO., Ltd</p> <p>Dong-Kuk Kim ( Manager)</p>
<p>-- Preparation of Monitoring Report.</p> <p>-- Compliance of the monitoring plan with the monitoring methodology</p> <p>-- Compliance of monitoring with the monitoring plan</p> <p>-- Assessment of data and calculation of GHG emission reductions</p>	<p>CERPD Inc. : (the Consultant):</p> <ol style="list-style-type: none"> <li>1. Jongbum Kim</li> <li>2. Wang Jun</li> </ol>

## 2.4 Site Inspections

The on-site assessment involved following activities,

- 1) An assessment of the implementation and operation of the project activity as per the VCS-PD;
- 2) A review of information flows for generating, aggregating and reporting the monitoring parameters;
- 3) Interviews with relevant personnel to confirm that the operational and data collection procedures are implemented in accordance with the approved monitoring plan;
- 4) A cross-check between information provided in the monitoring report and data from other sources such as operational records or similar data sources;
- 5) A check of the monitoring equipment including calibration performance and observations of monitoring practices against the requirements of the VCS-PD and the selected methodology;
- 6) A review of calculations and assumptions made in determining the GHG data and emission reductions;

- 7) An identification of quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.

## 2.5 Resolution of Findings

During the verification of a project activity, to identify issues that need to be further elaborated upon, researched or added to in order to confirm that the project activity meets the VCSA requirements and can achieve credible emission reductions, the verification team will issue a Corrective Action Request (CAR), a Clarification Request (CL) or a Forward Action Request (FAR) depending on different situations.

The objective of this phase of the verification is to resolve issues related to the monitoring, implementation and operations of the registered project activity that could impair the capacity of the registered project activity to achieve emission reductions or influence the monitoring and reporting of emission reductions prior to CCSC's positive conclusion on the GHG emission reduction calculation.

Findings established during the verification can either be seen as a non-fulfilment of criteria ensuring the proper implementation of a project or where a risk to deliver high quality emission reductions is identified.

A Corrective Action Request (CAR) will be raised if one of the following occurs:

- (a) Non-compliance with the monitoring plan or methodology are found in monitoring and reporting and has not been sufficiently documented by the project participants, or if the evidence provided to prove conformity is insufficient;
- (b) Modifications to the implementation, operation and monitoring of the registered project activity has not been sufficiently documented by the project participants;
- (c) Mistakes have been made in applying assumptions, data or calculations of emission reductions that will impact the quantity of emission reductions;
- (d) Issues identified in a FAR during validation to be verified during verification or previous verification(s) have not been resolved by the project participants.

A Clarification Request (CL) will be raised if information is insufficient or not clear enough to determine whether the applicable VCS requirements have been met.

A Forward Action Request (FAR) will be raised, for actions if the monitoring and reporting require attention and/or adjustment for the next verification period.

To guarantee the transparency of the verification process, the concerns raised are documented in more detail in Appendix B.

### 2.5.1 Forward Action Requests

There was no FAR to be addressed during the verification.

## 2.6 Eligibility for Validation Activities

The VVB of “China Classification Society Certification Company” (CCSC) commissioned by the project participant is one of eligible VVBs listed on the VCS website (<http://www.v-c-s.org/china-classification-society-certification-company>), and it holds the accreditation for validation/verification for the relevant sectoral scope. Therefore, CCSC is eligible for the validation/verification of the project activity.

## 3 VALIDATION FINDINGS

### 3.1 Participation under Other GHG Programs

The verification team has checked the official website of other GHG Programs like CDM, GS VER, and is able to confirm that the project is not included in any GHG programs or any other mechanisms that include GHG allowance trading. The net GHG emission reductions generated by the project during this monitoring period have not been used for compliance under any emission trading programs or mechanisms. The Project have not sought or received any other form of GHG-related environmental credit during this monitoring period.

The Project has been registered as a VCS project, and it did not apply for any other approved or not approved GHG programs.

In conclusion, CCSC can confirm that the project is eligible to participate under the VCS Program.

### 3.2 Methodology Deviations

Not applicable.

### 3.3 Project Description Deviations

The quantity of electricity consumed by the Project ( $EC_{PJ,y}$ ) was calculated based on the equipment rating specified by the manufacturer, and the conservative assumption is that the equipment was in continuous operation during the entire verification period.

As per the registered VCS PD Version 4, 2 dated 4 January 2012 /16/, this parameter was obtained from Measurement records of electricity consumption by the Project recorded monthly. While actually the conservative approach was sought, calculated based on the equipment rating specified by the manufacturer, and the conservative assumption that the equipment was in continuous operation during the entire verification period is deemed proper by verification team.

Electricity consumption by the Project is estimated based on electric ratings of Project equipment.

The following is the rated capacity of the fans:

- 1) No fan for BFG, as the BFG gas has pressure of 800-1000 mm Hg;
- 2) 2 set of fans (450 kW) in operation with one fan (450 kW) stand-by for COG gas, with gas pressure of 400-600 mm Hg;

3) 1 set of fan (240 kW) in operation with one fan (240 kW) stand-by for LDG gas, with gas pressure of 400-600 mm Hg.

This option uses the maximum electricity consumption, which result in a less emission reductions accounting. Therefore, this is conservative.

### 3.4 Grouped Project

Not Applicable since the project is a non-grouped project.

## 4 VERIFICATION FINDINGS

### 4.1 Project Implementation Status

#### 4.1.1 Project Implementation in accordance with the VCS PD

The verification team has performed an on-site visit to verify the real implementation of the project against the description in the VCS-PD /16/.

The project was verified to be a newly built waste energy recovery Co-generation power plant located in Donggok-ri Songsan-myeon Dangjin-gun Chungchongnam-do, Republic of Korea. Based on the site visit, the verification team confirms that all physical features of the Project presented in the registered VCS PD /16/ are in place and the PP has operated the Project as per the registered VCS PD /16/.

Steel mills create waste gas in the production processes, including Blast Furnace Gas (BFG) which is created from melting iron ore, Coke Oven Gas (COG) which comes from the dry distillation of flaming coal, and Linz Donawitz Gas) (LDG) from the decarburization process which gets rid of impurities from the melted iron from the blast furnaces. Figure 1 illustrates the project activity.

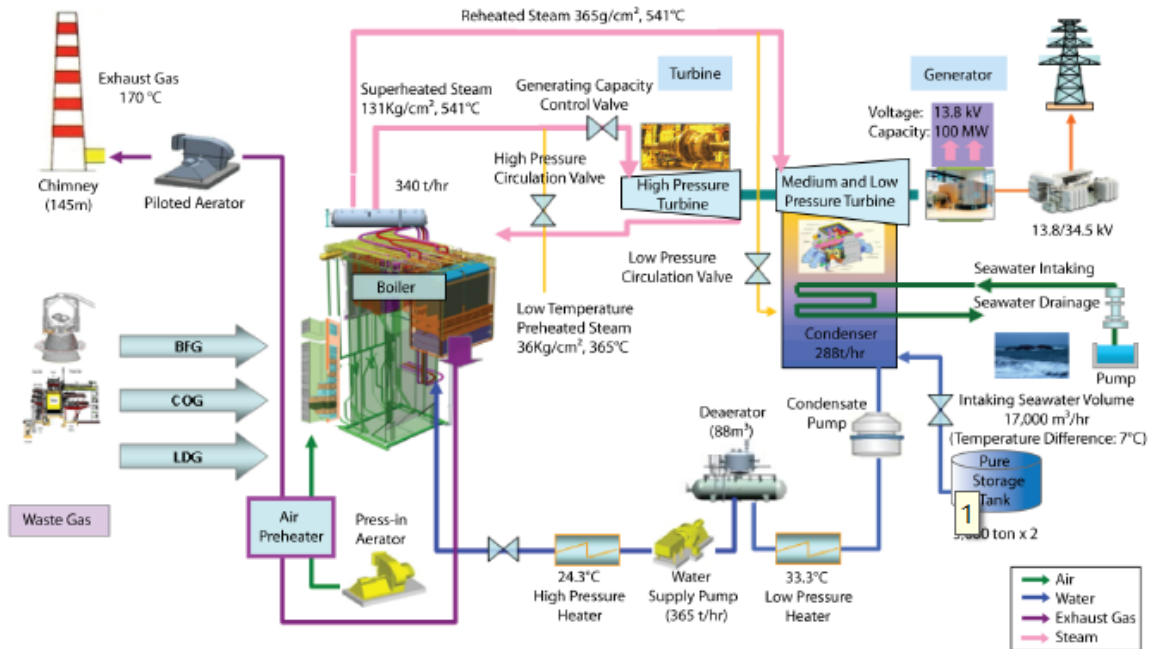


Figure 1. Project Activity Flow Chart

The Project was put into commercial operation from 24 March 2010, which was confirmed by previous validation and verification. All the components of the project activity were in place and well operated, and no change to the project design was observed during the site visit. The operation and maintenance records for the power plant have been provided during site visit. No special event which would affect the monitoring of the project was observed during the given monitoring period.

According to the information collected during on-site visit and the relevant evidence provided by project owner, CCSC can confirm that no project design change occurred during the monitoring period and the project was implemented in accordance with the registered VCS-PD/16/.

4.1.2 Compliance of monitoring with the monitoring plan

Through document review and on site visit, the verification team was able to confirm that the monitoring, including the actual monitoring system, data management has been carried out in accordance with the monitoring plan in the registered VCS-PD/16/ apart from the only minor changes shown below.

Parameter	Monitoring Requirement from VCS PD	Actual situation of the project implementation	Justification and Verification Conclusion
EG <sub>P,J,y</sub>	Measurement records of electricity consumption by the Project recorded	Two electric fans for COG (Coke Oven Gas) and one fan for LDG (Linz—Donawitz Process Gas) are used	Electricity consumption from these fans has been accounted for as project emissions. In this monitoring report, the amount of electricity consumption of booster fans (2 fans each with rated capacity of 450kW for

	monthly.	without metering. Electricity consumption by the Project is estimated based on electric ratings of those fans.	COG; 1 fan with rated capacity of 240kW for LDG) was calculated with the default value of manufacture's specification with the assumption of full operation for the monitoring period.  Using the fans rated power capacity and assumed round-clock operation will account maximum electricity consumption, then leading to more conservative value those results in the lower overall emission reductions of the project activity.
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#### 4.1.3 Remaining Issues from Previous Validation or Verification

There are no remaining issues from the previous validation /15/ and previous verification /17/ /18/. Further, deviations identified in the 1st verification process for the Project are minor and resolved in satisfactory way, in line with GHG principles and the ACM0012 methodology.

## 4.2 Accuracy of GHG Emission Reduction and Removal Calculations

### 4.2.1 Parameters and information flow

The parameters required by the monitoring plan and the way CCSC has verified the information flow (from data generation, aggregation, to recording, calculation and reporting for these parameters including the values) in the monitoring reports are described below:

#### (1) Electricity exported

<b>Data / Parameter</b>	$EG_{j,y}$
<b>Data unit</b>	MWh
<b>Description</b>	Quantity of electricity supplied to the grid by the project activity during the year $y$ .
<b>Measured /Calculated /Default:</b>	Measured
<b>Measurement Frequency</b>	Continuously measured and daily recorded
<b>QA/QC Procedures Applied, including calibration</b>	Cross check measurement results with KPX Electricity Transaction Notes (ETNs) which were aggregated monthly and annually. QA/QC procedures conducted on site was verified via review of following documents: <ul style="list-style-type: none"> <li>• Monthly aggregation record of the electricity supplied to the grid /3/</li> <li>• ETNs for the electricity delivered to the grid /8/</li> <li>• Calibration Records for the electricity meters /11/</li> </ul>

	<ul style="list-style-type: none"> <li>• VCS Monitoring Manual /10/</li> <li>• Training records /14/</li> </ul>																																												
<b>Verification Observations/Assessment</b>	<p>The quantity of electricity generated by the Project and supplied to the grid is monitored continuously by 8 meters (4 Main meters, 4 back-up meters). Data recorded by the meters are aggregated monthly and reported to the grid operator, Korea Power Exchange (KPX). KPX Electricity Transaction Notes (ETNs) were used for the purposes of cross-check. The ETNs are commercial evidences for billing and it can provide the reliable basis for cross-checking the electricity delivered to grid. Moreover the ETNs provider is Korea Power Exchange (KPX), the grid operator, who is authority for this service.</p> <p>The accuracy and calibration of the meters are shown as the following.</p> <table border="1" data-bbox="613 716 1373 1052"> <tr><td colspan="2">Main meter: M1</td></tr> <tr><td><b>Type</b></td><td>3P4W110V5A</td></tr> <tr><td><b>SN</b></td><td>PT-0808A177-01</td></tr> <tr><td><b>Accuracy</b></td><td>0.2s</td></tr> <tr><td><b>Calibration date</b></td><td>12/12/2012      24/03/2015</td></tr> <tr><td><b>Validity</b></td><td>11/12/2015      23/03/2019</td></tr> <tr><td><b>Calibrated by</b></td><td>Korea Testing Certification (KTC)</td></tr> </table> <table border="1" data-bbox="613 1094 1373 1430"> <tr><td colspan="2">Main meter: M2</td></tr> <tr><td><b>Type</b></td><td>3P4W110V5A</td></tr> <tr><td><b>SN</b></td><td>PT-0802A717-01</td></tr> <tr><td><b>Accuracy</b></td><td>0.2s</td></tr> <tr><td><b>Calibration date</b></td><td>12/12/2012      03/07/2015</td></tr> <tr><td><b>Validity</b></td><td>11/12/2015      02/07/2019</td></tr> <tr><td><b>Calibrated by</b></td><td>Korea Testing Certification(KTC)</td></tr> </table> <table border="1" data-bbox="613 1472 1373 1808"> <tr><td colspan="2">Main meter: M3</td></tr> <tr><td><b>Type</b></td><td>3P4W110V5A</td></tr> <tr><td><b>SN</b></td><td>PT-0808A176-01</td></tr> <tr><td><b>Accuracy</b></td><td>0.2s</td></tr> <tr><td><b>Calibration date</b></td><td>12/12/2012      26/08/2015</td></tr> <tr><td><b>Validity</b></td><td>11/12/2015      25/08/2019</td></tr> <tr><td><b>Calibrated by</b></td><td>Korea Testing Certification(KTC)</td></tr> </table> <table border="1" data-bbox="613 1850 1373 1879"> <tr><td colspan="2">Main meter: M4</td></tr> </table>	Main meter: M1		<b>Type</b>	3P4W110V5A	<b>SN</b>	PT-0808A177-01	<b>Accuracy</b>	0.2s	<b>Calibration date</b>	12/12/2012      24/03/2015	<b>Validity</b>	11/12/2015      23/03/2019	<b>Calibrated by</b>	Korea Testing Certification (KTC)	Main meter: M2		<b>Type</b>	3P4W110V5A	<b>SN</b>	PT-0802A717-01	<b>Accuracy</b>	0.2s	<b>Calibration date</b>	12/12/2012      03/07/2015	<b>Validity</b>	11/12/2015      02/07/2019	<b>Calibrated by</b>	Korea Testing Certification(KTC)	Main meter: M3		<b>Type</b>	3P4W110V5A	<b>SN</b>	PT-0808A176-01	<b>Accuracy</b>	0.2s	<b>Calibration date</b>	12/12/2012      26/08/2015	<b>Validity</b>	11/12/2015      25/08/2019	<b>Calibrated by</b>	Korea Testing Certification(KTC)	Main meter: M4	
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	<b>SN</b>	PT-0808A178-01		
	<b>Accuracy</b>	0.2s		
	<b>Calibration date</b>	12/12/2012	24/08/2015	
	<b>Validity</b>	11/12/2015	23/08/2019	
	<b>Calibrated by</b>	Korea Testing Certification(KTC)		
	Backup meter: M5			
	<b>Type</b>	3P4W110V5A		
	<b>SN</b>	51001402		
	<b>Accuracy</b>	0.5s		
	<b>Calibration date</b>	12/12/2012	24/03/2015	
	<b>Validity</b>	11/12/2015	23/03/2019	
	<b>Calibrated by</b>	Korea Testing Certification(KTC)		
	Backup meter: M6			
	<b>Type</b>	3P4W110V5A		
	<b>SN</b>	51001399		
	<b>Accuracy</b>	0.5s		
	<b>Calibration date</b>	12/12/2012	03/07/2015	
	<b>Validity</b>	11/12/2015	02/07/2019	
	<b>Calibrated by</b>	Korea Testing Certification(KTC)		
	Backup meter: M7			
	<b>Type</b>	3P4W110V5A		
	<b>SN</b>	51001400		
<b>Accuracy</b>	0.5s			
<b>Calibration date</b>	12/12/2012	26/08/2015		
<b>Validity</b>	11/12/2015	25/08/2019		
<b>Calibrated by</b>	Korea Testing Certification(KTC)			
Backup meter: M8				
<b>Type</b>	3P4W110V5A			
<b>SN</b>	51001398			
<b>Accuracy</b>	0.5s			
<b>Calibration date</b>	12/12/2012	24/08/2015		

	<b>Validity</b>	11/12/2015	23/08/2015
	<b>Calibrated by</b>	Korea Testing Certification(KTC)	
	<p>The calibration date of electricity meter is not accurate to the exact date, moreover, the calibration date does not cover the entire monitoring period in the MR (Version01). Therefore, <b>CAR2</b> was raised.</p> <p>By checking the revised MR and the Calibration Records for the electricity meters /11/, CCSC can confirm that the meter information in the updated MR (Version 02) is consistent with the calibration record and the real situation confirmed by the site visit. Hence, <b>CAR2</b> was closed.</p> <p>CCSC reviewed records of the calibration events for the current monitoring period for all eight meters used to record electricity generation data. The records indicated that the meters were operating accurately.</p>		
<b>Conclusions</b>	The monitoring results have been recorded consistently as per the approved frequency in the registered VCS PD /16/.		

## (2) Electricity Consumed

<b>Data / Parameter</b>	$EC_{P,j,y}$
<b>Data unit</b>	MWh
<b>Description</b>	Quantity of electricity consumed by the project electricity consumption source j in year y.
<b>Measured /Calculated /Default:</b>	As noted in Section 4.1 (Deviation), the quantity of electricity consumed by the Project ( $EC_{P,j,y}$ ) was calculated based on the equipment rating specified by the manufacturer, and the conservative assumption is that the equipment was in continuous operation during the entire verification period.
<b>Measurement Frequency</b>	/
<b>QA/QC Procedures Applied, including calibration</b>	<p>As per the registered VCS PD Version 4, 2 dated 4 January 2012 /16/, this parameter was obtained from Measurement records of electricity consumption by the Project recorded monthly. While actually the conservative approach was sought, calculated based on the equipment rating specified by the manufacturer, and the conservative assumption that the equipment was in continuous operation during the entire verification period is deemed proper by verification team.</p> <p>QA/QC procedures conducted on site was verified via review of following documents:</p> <ul style="list-style-type: none"> <li>• Specifications of rated power of LDG fans /6/</li> <li>• Specifications of rated power of COG fans /7/</li> <li>• VCS Monitoring Manual /10/</li> </ul>
<b>Verification Observations/Assessment</b>	<p>Electricity consumption by the Project is estimated based on electric ratings of Project equipment.</p> <p>The following is the rated capacity of the fans:</p>

	<ol style="list-style-type: none"> <li>1) No fan for BFG, as the BFG gas has pressure of 800-1000 mm Hg;</li> <li>2) 2 set of fans (450 kW) in operation with one fan (450 kW) stand-by for COG gas, with gas pressure of 400-600 mm Hg;</li> <li>3) 1 set of fan (240 kW) in operation with one fan (240 kW) stand-by for LDG gas, with gas pressure of 400-600 mm Hg.</li> </ol>
<b>Conclusions</b>	This option uses the maximum electricity consumption, which result in a less emission reductions accounting. Therefore, this is conservative.

**(3) LNG consumed**

<b>Data / Parameter</b>	$AF_{i,j,y}$														
<b>Data unit</b>	M <sup>3</sup>														
<b>Description</b>	LNG consumed on-site for power generation. Co-fires LNG in small quantities with waste gas to make up caloric deficiencies or to warm boilers upon startup.														
<b>Measured /Calculated /Default:</b>	Measured														
<b>Measurement Frequency</b>	Continuously measured, daily recorded and monthly reported														
<b>QA/QC Procedures Applied, including calibration</b>	<p>Invoice for buying the LNG was used for cross-checking total LNG consumed.</p> <p>QA/QC procedures conducted on site was verified via review of following documents:</p> <ul style="list-style-type: none"> <li>• Monthly aggregation record of the LNG gas consumed /4/ ;</li> <li>• Monthly invoice of LNG consumption; /9/</li> <li>• VCS Monitoring Manual ; /10/</li> <li>• Training records /14/</li> </ul>														
<b>Verification Observations/Assessment</b>	<p>Flow meters are used to record the LNG consumed. Data are recorded daily and monthly aggregated. The flow meters are calibrated upon abnormal operation by Korean Testing Certification (KTC).</p> <p>The relevant information of flow meters has been shown in the Table below:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;"><i>Tag No.</i></th> <th style="text-align: center;"><i>Model</i></th> <th style="text-align: center;"><i>Accuracy</i></th> <th style="text-align: center;"><i>remark</i></th> <th style="text-align: center;"><i>Calibration entity</i></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><i>FQIT-01 (previous)</i></td> <td style="text-align: center;"><i>SM-RI-X</i></td> <td style="text-align: center;"><i>±1.0 %</i></td> <td style="text-align: center;"><i>Has been replaced on 24/07/2014</i></td> <td rowspan="2" style="text-align: center;">Korean Testing Certification (KTC)</td> </tr> <tr> <td style="text-align: center;"><i>FQIT-02 (previous)</i></td> <td style="text-align: center;"><i>SM-RI-X</i></td> <td style="text-align: center;"><i>±1.0%</i></td> <td style="text-align: center;"><i>Has been replaced on 03/09/2014</i></td> </tr> </tbody> </table>	<i>Tag No.</i>	<i>Model</i>	<i>Accuracy</i>	<i>remark</i>	<i>Calibration entity</i>	<i>FQIT-01 (previous)</i>	<i>SM-RI-X</i>	<i>±1.0 %</i>	<i>Has been replaced on 24/07/2014</i>	Korean Testing Certification (KTC)	<i>FQIT-02 (previous)</i>	<i>SM-RI-X</i>	<i>±1.0%</i>	<i>Has been replaced on 03/09/2014</i>
<i>Tag No.</i>	<i>Model</i>	<i>Accuracy</i>	<i>remark</i>	<i>Calibration entity</i>											
<i>FQIT-01 (previous)</i>	<i>SM-RI-X</i>	<i>±1.0 %</i>	<i>Has been replaced on 24/07/2014</i>	Korean Testing Certification (KTC)											
<i>FQIT-02 (previous)</i>	<i>SM-RI-X</i>	<i>±1.0%</i>	<i>Has been replaced on 03/09/2014</i>												

	10513239 (new)	G4000	±0.5%	installed in 24/07/2014
	10513238 (new)	G4000	±0.62%	installed in 03/09/2014
<p>The LNG flow meter of FQIT-01 and FQIT-02 have been replaced during this monitoring period, there was no information of the new LNG flow meter in the MR, Thus, <b>CAR3 was raised.</b></p> <p>It has been confirmed by checking the MR (Version 02) that the relevant information of the new flow meters has been added. Hence, <b>CAR3 was closed.</b></p>				
<b>Conclusions</b>	<p>CCSC confirmed that:</p> <ul style="list-style-type: none"> <li>• The equipment for monitoring has an appropriate accuracy and has been controlled in accordance with the registered VCS PD. /16/</li> <li>• The monitoring results have been recorded consistently as per the approved frequency in the registered VCS PD</li> <li>• QA/QC procedures have been applied in accordance with the registered VCS-PD</li> </ul>			

The monitoring has been carried out (not for  $EC_{PJ,y}$ ; but justification is acceptable) in accordance with the monitoring plan contained in the registered VCS-PD /16/. All parameters (not for  $EC_{PJ,y}$ ; but justification is acceptable) were monitored and determined as per the monitoring plan.

**4.2.2 Assessment Data and Calculation**

According to the applied methodology **ACM0012 version 4.0.0 “Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects” /19/**, the emission reductions during the monitoring period are determined as the difference between baseline emissions, project emissions and leakage:

$$ER_y = BE_y - PE_y - L_y$$

**(1) Capping factors**

In accordance with Annex 3 of **ACM0012 version 4.0.0 “Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects” /19/** as well as the validated VCS-PD /16/, the Project may only generate VCUs where it can be demonstrated that the Project has not resulted in a decrease in waste energy utilization at the production facility (Hyundai Steel Mill) compared to a baseline. The baseline utilization for the production facility was previously validated and fixed at 45.7 percent.

Energy utilization data for this purpose are monitored continuously, aggregated daily and monthly, and compiled into a monthly report /5/. A facility operator and a manager both authenticate the monthly reports.

**Table 1 Yearly report of energy utilization data**

<b>The actual energy balance in 2013</b>
--

Waste Gas	For Hyundai Green power	For alternative uses (Hyundai Steel)	Total
	Percentage	Percentage	Percentage
COG	17.19%	82.81%	100%
BFG	45.50%	54.50%	100%
LDG	58.11%	41.89%	100%
Total	36.85%	63.15%	100%

<b>The actual energy balance in 2014</b>			
Waste Gas	For Hyundai Green power	For alternative uses (Hyundai Steel)	Total
	Percentage	Percentage	Percentage
COG	16.51%	83.49%	100%
BFG	44.34%	55.66%	100%
LDG	67.04%	32.96%	100%
Total	36.52%	63.48%	100%

<b>The actual energy balance in 2015</b>			
Waste Gas	For Hyundai Green power	For alternative uses (Hyundai Steel)	Total
	Percentage	Percentage	Percentage
COG	14.47%	85.53%	100%
BFG	40.70%	59.30%	100%
LDG	64.29%	35.71%	100%
Total	32.72%	67.28%	100%

<b>The actual energy balance in 2016</b>			
Waste Gas	For Hyundai Green power	For alternative uses (Hyundai Steel)	Total
	Percentage	Percentage	Percentage
COG	11.87%	88.13%	100%
BFG	39.16%	60.84%	100%
LDG	62.32%	37.68%	100%
Total	30.58%	69.42%	100%

<b>The actual energy balance in 2017</b>			
Waste Gas	For Hyundai Green power	For alternative uses (Hyundai Steel)	Total
	Percentage	Percentage	Percentage
COG	7.76%	92.24%	100%
BFG	36.56%	63.44%	100%

LDG	58.10%	41.90%	100%
Total	27.52%	72.48%	100%

CCSC reviewed these monthly reports /5/ as evidence of waste gas utilization by the Project and the production facility, and confirmed that the annual waste gas utilization by the production facility was greater than 45.7 percent, meaning that project implementation did not decrease the internal utilization of waste gas relative to the ratio confirmed at validation, thereby conforming to the requirement.

**(2) Baseline Emissions**

The project has no fossil fuel used for flaring the waste gas in the baseline, thus  $BE_{flst,y} = 0$ .

The proposed project doesn't claim GHG emission reductions from thermal energy for conservativeness.

The baseline emission calculation is indicated as the following:

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

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 ( $tCO_2$ ).
- $BE_{Elec,y}$  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  $y$  ( $tCO_2$ ).

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

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  $f_{wcm}$  of the project, it is 1 as the electricity generation is purely from use of waste energy. As the project is a Greenfield power plant,  $f_{cap}$  of this project is 1.

**Baseline emissions:** The total electricity generated during the verification period was multiplied by the Combined Margin CO<sub>2</sub> emission factor for the grid electricity displaced due to project activity ( $EF_y$ ), which had been previously calculated ex-ante and approved during validation. The Combined Margin value of 0.6641 tCO<sub>2</sub> / MWh applied in calculations is consistent with the validated VCS PD /16/.

$$BE_y = f_{cap} \times f_{WCM} \times EG_{i,j,y} \times EF_y$$

$EG_{i,j,y}$  Quantity of electricity supplied by the project to the grid (MWh)

$EF_y$  Combined Margin CO<sub>2</sub> emission factor for the grid electricity displaced due to project activity which had been previously calculated ex-ante and approved during validation.

The electricity exported by the Project to the grid in this reporting period is shown in the following table:

**Table 2 Electricity exported to the grid by the Project (MWh)**

Year	Electricity exports to the grid used for ER calculation
01/06-31/12/2013	1,427,435
2014	2,396,690
2015	2,102,325
2016	1,900,615
01/01-30/06/2017	1,028,669
<b>Total</b>	<b>8,855,734</b>

$$BE_y = f_{cap} \times f_{WCM} \times EG_{i,j,y} \times EF_y = 1 \times 1 \times 8,855,734 \text{MWh} \times 0.6641 \text{tCO}_2\text{e/MWh} = 5,881,093 \text{ tCO}_2\text{e}.$$

CCSC confirms that the calculation method of the baseline emission in the monitoring report and ER calculation spreadsheet /2/ is in compliance with the registered VCS PD /16/ and ACM0012 version 4.0.0 “**Consolidated baseline** methodology for GHG emission reductions from waste energy recovery projects”./19/

### **(3) Project Emissions**

#### **Project Emissions from LNG Consumed**

The Project also combusts LNG in small quantities with waste gas to make up caloric deficiencies or to warm boilers upon startup. The quantity of LNG consumed by the Project ( $AF_{i,j,y}$ ) was sourced from daily project monitoring data aggregated monthly. Project emissions from LNG consumption ( $PE_{AF,y}$ ) was quantified by multiplying the total LNG consumption by the net calorific value of LNG ( $NCV_i$ ), sourced from IPCC 2006 and the CO<sub>2</sub> emission factor for LNG ( $EF_{AF,i}$ ), according to “Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion”.

<i>Period</i>	<i>LNG Consumed (m<sup>3</sup>)</i>
Jun-13	1,390,217
Jul-13	1,258,133
Aug-13	1,869,958
Sep-13	1,530,332
Oct-13	1,643,013
Nov-13	1,879,280
Dec-13	671,600
Jan-14	1,425,183
Feb-14	1,339,764
Mar-14	1,395,151
Apr-14	1,378,601
May-14	1,307,619
Jun-14	1,314,002
Jul-14	456,139
Aug-14	117,546
Sep-14	71,744
Oct-14	109,229
Nov-14	80,143
Dec-14	254,936
Jan-15	238,643
Feb-15	203,093
Mar-15	331,771
Apr-15	336,241
May-15	155,025
Jun-15	73,833
Jul-15	69,693
Aug-15	34,218
Sep-15	26,953
Oct-15	61,542
Nov-15	28,610
Dec-15	64,762
Jan-16	272,634
Feb-16	228,778
Mar-16	216,200
Apr-16	111,341
May-16	114,174
Jun-16	419,621
Jul-16	117,807
Aug-16	9,734
Sep-16	2,038
Oct-16	345,033

Nov-16	36,845
Dec-16	230,073
Jan-17	143,636
Feb-17	229,674
Mar-17	80,534
Apr-17	43,687
May-17	48,733
Jun-17	19,000
Total	23,786,516

Total LNG consumed is verified to be 23,786,516 m<sup>3</sup>.

$$PE_{AF,y} = AF_{i,j,y} \times NCV \times EF_{AF,i} = 23,786,516 \times 1000 / 22.4 \times 16 \times 10^{-9} \times 50.4 \times 58.3 = 49,923 \text{ tCO}_2\text{e}$$

### **Project Emissions from electricity consumed**

The Project consumes grid-connected electricity for operating waste gas processing equipment. As noted in Section 4.1, the quantity of electricity consumed by the Project ( $EC_{PJ,y}$ ) was calculated based on the equipment rating specified by the manufacturer, and the conservative assumption is that the equipment was in non-stop operation during the entire verification period.

The specifications of the booster fans for LDG and COG are detailed in Table 3 and the imported power to the project is 40,766 MWh during the given monitoring period.

**Table 3 Specifications of Booster Fans**

	<b>Model, specification and performance</b>	<b>Quantity (set)</b>
COG	450kW	2
LDG	240kW	1

Total electricity consumed is calculated as the following:

- (1) FAN for COG  
450kW X 2set X 24hr X 1490 days = 32,184, 000 kWh
- (2) Fan for LDG  
240kW X 24hrs X 1490 days = 8,582,400 kWh

Therefore, the total electricity consumed is 32,184, 000 kWh + 8,582,400 kWh = 40,766 MWh

The total electricity consumed during the verification period was multiplied by the CO<sub>2</sub> emission factor for the grid ( $EF_y$ ), which had been previously calculated ex-ante and approved during validation, and the average transmission and distribution loss factor ( $TDL_{j,y}$ ) to determine the quantity of project emissions from electric consumption ( $PE_{EL,y}$ ), as per "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

$$PE_{EL,y} = EC_{PJ,y} \times EF_y (1 + TDL_{j,y})$$

$EC_{PJ,y}$  Project consumes grid-connected electricity for operating waste gas processing equipment (MWh)

$TDL_{j,y}$  20%, average transmission and distribution loss factor (%)

$$PE_{EL,y} = EC_{PJ,y} \times EF_y (1 + TDL_{i,y}) = 40,766 \times 0.6641 (1 + 20\%) = 32,488 \text{ tCO}_2\text{e}$$

Thus, total PE =  $PE_{EL,y} + PE_{AF,y} = 32,488 + 49,923 = 82,411 \text{ tCO}_2\text{e}$

### Leakage

There are no leakages that need to be considered in applying the methodology **ACM0012 version 4.0.0** “**Consolidated baseline** methodology for GHG emission reductions from waste energy recovery projects”.

### Emission reduction

Therefore, the emission reductions in this monitoring period are:

$$ER_y = BE_y - PE_y - L_y = 5,881,093 - 82,411 - 0 = 5,798,682 \text{ tCO}_2\text{e}.$$

### Comparison of ERs

The estimated annual emission reductions in the registered VCS PD Version 4, dated 14 January 2012 were 1,774,699 tCO<sub>2</sub>e. Hence the estimated emission reductions for the duration of this monitoring period from 01/06/2013 to 30/06/2017 (1490 days) are 7,244,662 tCO<sub>2</sub>e.

$$\text{i.e.: } 1,774,699 \times 1490 / 365 \text{ tCO}_2\text{e} = 7,244,662 \text{ tCO}_2\text{e}$$

During the monitoring period, the emission reductions (5,798,682 tCO<sub>2</sub>e) are less than the emission reductions predicted ex-ante in the registered VCS PD Version 4, dated 4 January 2012 for an equivalent number of days. CCSC considers the value of verified emission reduction is reasonable.

## 4.3 Quality of Evidence to Determine GHG Emission Reductions and Removals

Based on the document review and physical site inspection, CCSC can confirm that all necessary documentation were collected, referenced and aggregated and were easily accessible in hard-copy and electronic format. Measurements are performed by calibrated equipment, and the key data were cross-checked via other sources. No assumptions are used that have any material influence on reported emission reductions.

In summary, all necessary documentation is collected, referenced and is easily accessible in hard-copy or electronic format. The data pertaining to the monitored parameters are maintained in the identified internal records and consistent with the values stated in the Monitoring Report (version 02) /1/. Key data have been cross-checked via external sources, such as ETNs.

#### 4.4 Non-Permanence Risk Analysis

During on-site visit, the verification team observed that the monitoring personnel are well trained, /14/ which demonstrate that they have sufficient competence to carry out the relevant monitoring tasks.

The routine requirements and log of the internal training for operating and maintaining the equipment were provided by the project owner /13/. During the on-site visit, it has been observed that the maintenance staffs have performed the routine equipment maintenance in accordance with the internal requirements for equipment tour inspection of the company.

CCSC can confirm that the personnel training and the equipment maintenance have been implemented properly by checking the training and maintenance records /13/ /14/, and by interviewing with site personnel.

All monitored data will be archived in electronic form and be kept for at least 2 years after the end of the last crediting period or till the last issuance of VERs for the project activity whichever occurs later.

### 5 SAFEGUARDS

#### 5.1 No Net Harm

There is no potential negative environmental and socio-economic impact identified by the project proponent.

#### 5.2 Local Stakeholder Consultation

Since this is the third verification of the project activity, local stakeholders' consultation details are not applicable in this project activity.

### 6 VERIFICATION CONCLUSION

CCSC has carried out the verification of the project "*Hyundai Steel Waste Energy Cogeneration Project*". The verification was performed based on the requirements set by Voluntary Carbon Standard (VCS) Version 3.7 /20/, as well as criteria provide for consistent project operations, monitoring and reporting. This verification covers the period from 01/06/2013 to 30/06/2017 inclusive.

In the course of the verification, 3 Corrective Action Request (CAR) were raised and successfully closed. The verification is based on the VCS-MR (version01), the revised VCS-MR (version02) /1/, the registered VCS-PD /16/, the validation report /15/, ER calculation spread sheet /2/ and supporting documents available to CCSC.

As the result of the verification, CCSC confirms that:

- The project activity has been implemented and operated as per the registered VCS-PD and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place;
- The VCS-MR and other supporting documents provided are complete in accordance with the latest applicable version of the VCS Registration & Issuance Process /22/ and in accordance with the additional requirements stated by the VCS Association (VCSA);
- The actual monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan and the approved methodology i.e. *ACM0012 (Version 4.0.0) /19/*;
- The GHG emission reductions are calculated without material misstatements and in a conservative and appropriate manner.

Based on the evidence and information that are considered necessary to guarantee that GHG emission reductions are appropriately calculated, CCSC confirms the following statement:

Verification period: from 01/06/2013 to 30/06/2017

Verified GHG emission reductions and removals in the above verification period:

Year	Baseline emissions or removals (tCO <sub>2</sub> e)	Project emissions or removals (tCO <sub>2</sub> e)	Leakage emissions (tCO <sub>2</sub> e)	Net GHG emission reductions or removals (tCO <sub>2</sub> e)
2013 (01/06-31/12)	947,960	26,130	0	921,829
2014	1,591,642	27,372	0	1,564,269
2015	1,396,154	11,368	0	1,384,786
2016	1,262,199	12,375	0	1,249,824
2017 (01/01-30/06)	683,139	5,166	0	677,974
<b>Total</b>	5,881,093	82,411	-	5,798,682

## APPENDIX A: REFERENCE

Documents provided by the Project Participant and relevant background documents have been reviewed or referenced for the periodic verification conclusions.

/1/	VCS Monitoring report of Hyundai Steel Waste Energy Cogeneration Project Version 01 dated 24/09/2017, Version 02 dated 06/03/2018 The monitoring period is from 01/06/2013 to 30/06/2017.
/2/	ER calculation spreadsheet for the period from 01/06/2013 to 30/06/2017
/3/	Monthly aggregation record of the electricity supplied to the grid, from 01/06/2013 to 30/06/2017
/4/	Monthly aggregation record of the LNG gas consumed, from 01/06/2013 to 30/06/2017
/5/	Energy consumption data statistics
/6/	Specifications of rated power of LDG fans
/7/	Specifications of rated power of COG fans
/8/	KPX: Electricity Transaction Notes (ETNs) , from 01/06/2013 to 30/06/2017
/9/	NG supplier: Monthly invoice of LNG consumption for the monitoring period
/10/	VCS Monitoring Manual for Hyundai Steel Waste Energy Cogeneration Project
/11/	Calibration records of electricity meters (M1-M8)
/12/	LNG supply contract
/13/	Operation and maintenance record
/14/	VCS training records
/15/	First Environment, Inc.: VCS Validation report for the Hyundai Steel Waste Energy Cogeneration Project, version 1 dated 09/02/2012. <a href="http://vcsprojectdatabase.org/#/project_details/786">http://vcsprojectdatabase.org/#/project_details/786</a>
/16/	CERPD Inc.:VCS Project Description (VCS-PD) for the Hyundai Steel Waste Energy Cogeneration Project, final version Version 4, dated 14/01/2012. <a href="http://vcsprojectdatabase.org/#/project_details/786">http://vcsprojectdatabase.org/#/project_details/786</a>
/17/	First Environment, Inc.: 1st verification report for the Hyundai Steel Waste Energy Cogeneration Project, version 1.0, 03 May 2012
/18/	CB, INC (CB) : 2 <sup>nd</sup> verification report for the Hyundai Steel Waste Energy Cogeneration Project, version 2.0, 16 January 2014
/19/	CDM Executive Board: Approved baseline methodology "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects", ACM0012 version 4.0.0. <a href="http://cdm.unfccc.int/methodologies/PAMethodologies/approved">http://cdm.unfccc.int/methodologies/PAMethodologies/approved</a> .
/20/	VCS Standard, Version 3.7, dated 21/06/2017 <a href="http://database.v-c-s.org/sites/vcs.benfredaconsulting.com/files/VCS_Standard_v3.7.pdf">http://database.v-c-s.org/sites/vcs.benfredaconsulting.com/files/VCS_Standard_v3.7.pdf</a>
/21/	VCS Validation and Verification Manual, Version 3.2, dated 19/10/2016 <a href="http://database.v-c-s.org/sites/vcs.benfredaconsulting.com/files/VCS_Validation_Verification_Manual_v3.2.pdf">http://database.v-c-s.org/sites/vcs.benfredaconsulting.com/files/VCS_Validation_Verification_Manual_v3.2.pdf</a>

/22/	VCS Registration & Issuance Process, Version 3.8, dated 21/06/2017 <a href="http://database.v-c-s.org/sites/vcs.benfredaconsulting.com/files/Registration_and_Issuance_Process_v3.8.pdf">http://database.v-c-s.org/sites/vcs.benfredaconsulting.com/files/Registration_and_Issuance_Process_v3.8.pdf</a>
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## APPENDIX B: RESOLUTION OF CORRECTIVE ACTION REQUESTS AND CLARIFICATION REQUESTS

No.	CAR/CL/FAR	Response by Project Participants/ CCSC's conclusion of assessment
<b>CAR1</b>	According to the VCS-MR template, the section 1.1 is supposed to include the total GHG emission reductions generated in this monitoring period.	<p><u>Response by Project Participants:</u></p> <p>The relevant information has been added in the revised in the MR (Version 02).</p> <p><u>CCSC's conclusion of assessment:</u></p> <p>It has been confirmed that the total GHG emission reductions has been added in the MR (Version 02).</p> <p>Hence, <b>CAR1</b> was closed.</p>
<b>CAR2</b>	The calibration date of electricity meter is not accurate to the exact date, moreover, the calibration date does not cover the entire monitoring period.	<p><u>Response by Project Participants:</u></p> <p><u>It has been upgraded in Monitoring Report ver. 02</u></p> <p><u>CCSC's conclusion of assessment:</u></p> <p>By checking the revised MR and the Calibration Records for the electricity meters /11/, CCSC can confirm that the meter information in the updated MR (Version 02) is consistent with the calibration record and the real situation confirmed by the site visit.</p> <p>Hence, <b>CAR2</b> was closed.</p>
<b>CAR3</b>	The LNG flow meter of FQIT-01 and FQIT-02 have been replaced during this monitoring period, there was no information of the new LNG flow meter in the MR.	<p><u>Response by Project Participants:</u></p> <p><u>The relevant information has been added in the revised in the MR (Version 02).</u></p> <p><u>CCSC's conclusion of assessment:</u></p> <p>It has been confirmed by checking the MR (Version 02) that the relevant information of the new flow meters has been added.</p> <p>Hence, CAR3 was closed.</p>

No.	CAR/CL/FAR	Response by Project Participants/ CCSC's conclusion of assessment
<b>CL1</b>	<p>In section 2.2.1 of the monitoring report, it was stated that according to the monitoring plan in the VCS PD, the quantity of electricity consumed by the project electricity consumption (<math>EC_{P,J,y}</math>), would be measured by standard meter continually. However, there is no standard meter for measuring electricity consumed in actual operation. Please clarify whether this deviation should be attributed to the Methodology Deviation or Project Description Deviation. Meantime, the section number was not consistent with the table of contents, please update the table of contents.</p>	<p><u>Response by Project Participants:</u></p> <p>The deviation for calculation of electricity consumption (<math>EC_{P,J,y}</math>) is just a conservative way to calculate project emission since there was no accurate data. It did not change any contents from methodology. So we think the deviation for calculation of electricity consumption (<math>EC_{P,J,y}</math>) should be in Project Description Deviation.</p> <p>We have upgraded in MR also the table of contents</p> <p><u>CCSC's conclusion of assessment:</u></p> <p>Using the fans rated power capacity and assumed round-clock operation will account maximum electricity consumption, then leading to more conservative value those results in the lower overall emission reductions of the project activity. CCSC confirmed this change of the monitoring method for parameter (<math>EC_{P,J,y}</math>) is supposed to be Project Description Deviation rather than Methodology Deviation. The updated MR has put this deviation into Section 2.2.2 Project Description Deviations. Therefore, CL1 has been closed.</p>

**APPENDIX C: CERTIFICATES OF COMPETENCE**



Appendix 9

**CERTIFICATE OF COMPETENCE**

Date of issue:16/10/2017

**Ms. Zheng Ling**

Has been qualified in accordance with *CDM Personnel Competence Requirements and Professional Competence Evaluation Instructions (CDMI0301)* as

- CDM validator for Technical Area(s): TA1.2
- CDM verifier for Technical Area(s): TA1.2
- Technical expert for Technical Area(s): TA13.1

Huang ShiYuan  
CCSC General Manager



Appendix 9

**CERTIFICATE OF COMPETENCE**

Date of issue:16/10/2017

**Ms. Li Cuiping**

Has been qualified in accordance with *CDM Personnel Competence Requirements and Professional Competence Evaluation Instructions (CDMI0301)* as

- CDM validator for Technical Area(s): TA1.1/TA1.2/TA9.2
- CDM verifier for Technical Area(s): TA1.1/TA1.2/TA9.2
- Technical expert for Technical Area(s): \_\_\_\_\_

Huang ShiYuan  
CCSC General Manager



Appendix 9

**CERTIFICATE OF COMPETENCE**

Date of issue:16/10/2017

**Ms. Liu Ruyun**

Has been qualified in accordance with *CDM Personnel Competence Requirements and Professional Competence Evaluation Instructions (CDMI0301)* as

- CDM validator for Technical Area(s): TA1.2/TA13.2
- CDM verifier for Technical Area(s): TA1.2/TA13.2
- Technical expert for Technical Area(s): \_\_\_\_\_

Huang ShiYuan  
CCSC General Manager