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# VALIDATION REPORT

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VALIDATION OF THE REVISED  
MONITORING PLAN:

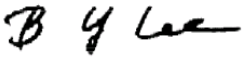
**Mokpo Landfill Gas Recovery Project  
for Electricity Generation**

**UNFCCC Ref. No. 2834**

**REPORT No. 2010-09**

VERSION No. 01

## VALIDATION REPORT

Date of first issue: 13 Sep. 2010	Date of this revision 13 Sep. 2010	Project No.: COP-55	Korean Foundation for Quality  13F, Woolim Lion's Valley B Bldg. 371-28 Gasan-dong, Geumcheon-gu, Seoul, Korea Tel. +82 2 2025 9061 Fax. +82 2 2025 9069 <a href="http://www.kfq.or.kr">http://www.kfq.or.kr</a>
Approved by: Byung Yong LEE  Director of Sustainable Management Institute		Organisational unit: Korean Foundation for Quality (KFQ)	
Client: Hanwha Corporation		Client ref.: Tae Jin Yang	

Summary:

**Project Title :** Mokpo Landfill Gas Recovery Project for Electricity Generation

**Investor Country :** Republic of Korea

**Host Country :** Republic of Korea

**Project Participants :** Hanwha Corporation

**Applied Methodology(Ver.) :** AMS-III.G (Ver. 06)  
AMS-I.D (Ver. 13)


**Technology/Measure to be employed :** LFG capture and use for electricity generation

**Crediting Period :** 10 years fixed crediting period (Starting from 18<sup>th</sup> February 2010)

**Estimated ER :** 25,795 ton CO<sub>2</sub>/year

**Project Size :** Small Scale

As the result of the validation of revised monitoring plan of the project, it can be confirmed that ***Mokpo Landfill Gas Recovery Project for Electricity Generation*** as described in the revised monitoring plan, meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the baselines and monitoring methodology AMS-III.G (Version 06) and AMS-I.D(Version 13). KFQ thus requests the revision of MP of the registered project.

Work carried out by :  Sung Han YOON (Audit team Leader, GHG auditor) Yu Shim JEONG (Audit team member, GHG auditor)	Work Verified by :  Dong Cheon SEO 
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## Abbreviations

CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CO <sub>2</sub>	Carbon dioxide
CO <sub>2e</sub>	Carbon dioxide Equivalent
DOE	Designated Operational Entity
ER	Emission Reduction
GHG	Greenhouse gas(es)
KFQ	Korean Foundation for Quality
LFG	Landfill Gas
MP	Monitoring Plan
MSW	Municipal Solid Waste
PDD	Project Design Document
UNFCCC	United Nations Framework Convention for Climate Change

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Appendix: Qualification of Validation Team

## **1 INTRODUCTION**

Korean Foundation for Quality (KFQ) has been engaged by Hanwha Corporation to perform a validation of revised monitoring plan of the ‘Mokpo Landfill Gas Recovery Project for Electricity Generation (UNFCCC Ref. no. 2834) in Republic of Korea. This validation report summarizes the findings and/or opinion for the revised monitoring plan validation, performed on the basis of applied methodology (AMS-III.G version 06 and AMS-I.D version 13) and “Procedures for revising monitoring plans in accordance with paragraph 57 of the modalities and procedures for the CDM(version 02)” in annex 28 of EB49 meeting report.

### **1.1 Objective**

Paragraph 57 of the modalities and procedures for the CDM allows project participants to revise monitoring plans in order to improve accuracy and/or completeness of information, subject to the revision being validated by a DOE. The purpose of a validation of revised monitoring plan is to have an independent third party assessment of the project's monitoring plan revision. In particular, the level of accuracy or completeness in the proposed revision of the monitoring plan, and the conformity with approved monitoring methodology applicable to the project activity.

### **1.2 Scope**

The validation scope is defined as an independent and objective review of the revised MP and other relevant documents. The information in these documents is reviewed against the approved methodology (AMS-III.G version 06, AMS-I.D version 13) and relevant decisions by the CDM Executive Board.

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

### **1.3 GHG Project Description**

As per URL of <http://cdm.unfccc.int/Projects/DB/emc1249265030.9/view>, there is no change in the project activity description. The project was registered on 18 February 2010 under UNFCCC Ref. No. 2834

## **1.4 Validation Team**

The validation team consisted as follows:

Sung Han YOON (Audit team Leader, GHG auditor)

Yu Shim JEONG (Audit team member, GHG auditor)

The qualification of each individual validation team member is detailed in Appendix to this report.

## 2 METHODOLOGY

### 2.1 Desk review of the Documents

The revised monitoring plan submitted by the client and additional background documents related to further monitoring aspects were reviewed as initial step of the validation process.

### 2.2 Follow-up Interviews with Project Stakeholders

According and as a result of desk review, KFQ discussed with the project participants the revised monitoring plan at the project site on 10 September 2010.

Interviewed organisation	Interview topics
Hanwha Corporation (Project Participant) - Ji Hyun, PARK - Chang Wook AN - Kun Hong LEE - Jing Young CHOI	➤ Revised Monitoring plan ➤ Monitoring parameters listed in the PDD and revised MP ➤ Installed equipment specification ➤ Responsibility and authority
EcoNetwork Co., Ltd (Consulting Company) - Sanghyeok PARK - Seonyoung MOON	

### 2.3 Internal Quality Control

According to KFQ's Procedure for deciding whether proceeded a request for revising monitoring plan, the validation report and validation findings underwent a technical review before being submitted a request for revising monitoring plan. The technical review was performed by a technical reviewer qualified in accordance with KFQ's qualification scheme for CDM validation and verification.

### 3 VALIDATION FINDINGS

#### 3.1 Participation Requirements

As per the validation report by EMC, dated 17<sup>th</sup> February 2010 available on UNFCCC webpage <http://cdm.unfccc.int/Projects/DB/emc1249265030.9/view>. No changes have been made.

#### 3.2 Project Design

As per the validation report by EMC, dated 17<sup>th</sup> February 2010 available on UNFCCC webpage <http://cdm.unfccc.int/Projects/DB/emc1249265030.9/view>. No changes have been made.

#### 3.3 Additionality

As per the validation report by EMC, dated 17<sup>th</sup> February 2010 available on UNFCCC webpage <http://cdm.unfccc.int/Projects/DB/emc1249265030.9/view>. No changes have been made.

#### 3.4 The revision of Monitoring Plan

The validation team confirmed that the revised monitoring plan is in line with the monitoring methodology (AMS-III.G version 06, AMS-I.D version 13) and paragraph 57 of the modalities and procedures for the CDM. And the revised MP is not reduced the level of accuracy and completeness in the monitoring and verification process and there will be no impact in the emission reduction calculations.

The validation findings in the revised monitoring plan are as follows:

##### 3.4.1 Parameters determined

N/A

##### 3.4.2 Parameters to be monitored

Some parameters in the registered monitoring plan are excluded and some parameters are modified in the revised monitoring plan. These parameters are as follows:

##### (1) Excluded parameters

- **T and P** parameters are excluded in the MP

Since project activity started, **LFG<sub>electricity,y</sub>** (amount of LFG combusted in power plant) in the registered MP has been measured by thermal mass flow meter that automatically measures temperature and pressure and reads the volume as normal cubic meters.

Temperature and pressure of landfill gas are required to determine the density of methane combusted in the applied methodology, AMS III.G (version 06). Therefore, if the LFG volume can be measured directly as normal cubic meters (Nm<sup>3</sup>), separate T, P measurements are not needed (the density of methane at standard temperature and pressure is 0.0007168 tCH<sub>4</sub>/m<sup>3</sup>CH<sub>4</sub>, in ACM0001 ver.11). Thus, the validation team has confirmed that the monitoring plan with the

exclusion of T and P parameters is still conformity with the methodology applied.

- $W_x$ ,  $p_{n,j,x}$  and  $z$  parameters are excluded in the MP.

$W_x$ ,  $p_{n,j,x}$  and  $z$  parameters are used for estimating the methane emissions potential and subsequently estimated emission reduction according to “Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site” in the PDD.

However the actual emission reduction achieved by the project during the crediting period is calculated using the amount of methane recovered and destroyed/gainfully used by the project activity which are measured directly with monitoring equipment, thermal mass flow meter and gas analyzer in accordance with the methodology applied, AMS-III.G version 06

On the other hand,  $W_x$ ,  $p_{n,j,x}$  and  $z$  parameters can be used to cross check whether  $LFG_{electricity,y}$  is over estimated in the project activity during the crediting period or not. But the cross check is not necessary in the applied methodology.

Also, it may be problem for PP to implement as the test cost for  $W_x$ ,  $p_{n,j,x}$  and  $z$  parameters as per registered PDD is too expensive and the management of dumping in landfill site is out of the PP's control. (Mokpo city has the responsibility to manage dumping in landfill site)

Accordingly, the validation team have concluded the exclusion of these parameters is valid and do not affect on the level of accuracy of the amount of emission reduction.

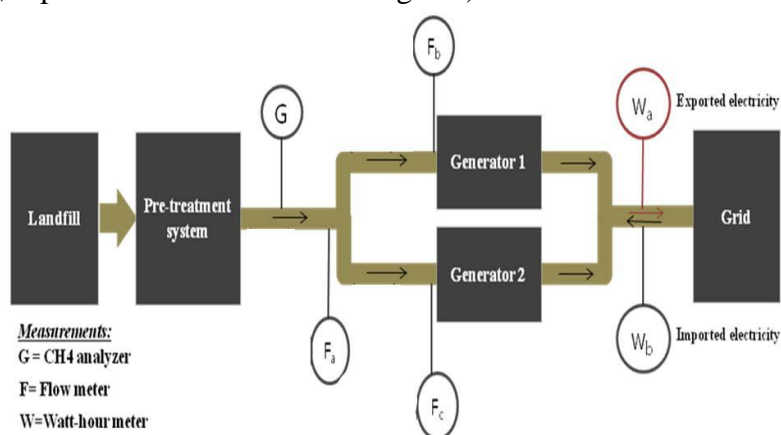
## (2) Modified parameters

$LFG_{electricity,y}$  parameter's description is modified.

In the parameter description of  $LFG_{electricity,y}$ , The data unit of  $LFG_{electricity,y}$  is changed from  $m^3/y$  to  $Nm^3/y$  in line with the actual monitoring situation and additional comment is inserted that “No separate monitoring of temperature and pressure when expressing LFG volumes in normalized cubic meters” Which is assessed together with above (1) T and P parameters.

As monitoring parameters revised, some descriptions related the excluded parameters are also changed in monitoring plan.

- The figure of the location monitoring facilities in PDD B.7.2 reflects the parameters changes. (Separate T, P points are excluded in the figures)



The rest of the monitoring plan remains the same as mentioned in the registered PDD available at UNFCCC website <http://cdm.unfccc.int/Projects/DB/emc1249265030.9/view>.

The validation team confirmed that exclusion or modification of parameters described above are implemented properly for ensuring the level of accuracy and completeness in the monitoring and verification process, which is not reduced as a result of the revision.

### **3.4.3 Calculation of GHG Emissions**

The emission reduction calculation does not change

### **3.4.4 Responsibility and Authority**

The responsibilities and authorities of monitoring parameters and maintenance do not change in the revised MP.

## **3.5 Environmental Impacts**

As per the validation report by EMC, dated 17<sup>th</sup> February 2010 available on UNFCCC webpage <http://cdm.unfccc.int/Projects/DB/emc1249265030.9/view>. No changes have been made.

## **3.6 Comments by Localstakeholders**

As per the validation report by EMC, dated 17<sup>th</sup> February 2010 available on UNFCCC webpage <http://cdm.unfccc.int/Projects/DB/emc1249265030.9/view>. No changes have been made.

## 4 VALIDATION OPINION

Korean Foundation for Quality (KFQ) has performed a validation of the revised Monitoring Plan of CDM project Ref. No. 2834: Mokpo Landfill Gas Recovery Project for Electricity Generation

The validation is based on the information made available to us and the engagement conditions. And the review of the revised monitoring plan, related documents, and the subsequent follow-up interviews has conducted with sufficient evidence to determine the fulfillment of all stated criteria.

In our opinion, the revised monitoring plan meets all relevant UNFCCC requirements for the CDM.

Hence, it can be confirmed that:

- a. The level of accuracy or completeness in the monitoring and verification process is not reduced as a result of the revision, also can be confirmed that the proposed revision is in accordance to the project activity.
- b. The proposed revision of the monitoring plan is in accordance with the approved monitoring methodology applicable to the project activity.

Therefore, KFQ recommends the replacement of the monitoring plan of the registered PDD as the submitted revision.

## 5. REFERENCES

1. Revised Monitoring Plan (B.7 section of PDD)
2. Registered PDD (version 4 dated 27<sup>th</sup> November 2009)
3. Validation Report (dated 17<sup>th</sup> Feb 2010)
4. Methodology:

### **Applied methodology in the registered PDD**

- AMS-III.G(version 6) : Landfill methane recovery
- AMS-I.D(version 13) : Grid connected renewable electricity generation

### **Reference methodology**

- ACM0001(version 11) : Consolidated baseline and monitoring methodology for landfill gas project activities
5. Operating manual – Mokpo LFG Power plant Monitoring
  6. Web catalogue/Introduction manual of the thermal mass flow meters (applied thermal mass flow meters in the project activity, FTC KC-2000 series)

Appendix  
Qualification of Validation Team



# CERTIFICATE OF COMPETENCE

**Name:** Sung Han YOON

**Qualification:**

	Validation	Verification
-Lead auditor	<input type="checkbox"/>	<input type="checkbox"/>
-Auditor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
-Technical Expert	<input type="checkbox"/>	<input type="checkbox"/>
-Local Expert	<input type="checkbox"/>	<input type="checkbox"/>

**Scopes of Expertise:**

Sectoral scope		Technical code
1 Energy industries(renewable - / non-renewable sources)	<input checked="" type="checkbox"/>	1.3 Solar energy, 1.4 Biomass
2 Energy distribution	<input type="checkbox"/>	
3 Energy demand	<input type="checkbox"/>	
4 Manufacturing industries	<input type="checkbox"/>	
5 Chemical industries	<input checked="" type="checkbox"/>	5.1 N <sub>2</sub> O reduction/destruction in chemical industry
9 Metal production	<input type="checkbox"/>	
10 Fugitive emissions from fuels(solid, oil and gas)	<input type="checkbox"/>	
11 Fugitive emissions from production and consumption of halocarbons and sulfur hexafluoride	<input type="checkbox"/>	
13 Waste handling and disposal	<input checked="" type="checkbox"/>	13.1 Landfill gas recovery

Approved by Qualification Committee of KFQ on 31 July 2009



## CERTIFICATE OF COMPETENCE

**Name:** Yu Shim JEONG

**Qualification:**

	Validation	Verification
-Lead auditor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
-Auditor	<input type="checkbox"/>	<input type="checkbox"/>
-Technical Expert	<input type="checkbox"/>	<input type="checkbox"/>
-Local Expert	<input type="checkbox"/>	<input type="checkbox"/>

**Scopes of Expertise:**

Sectoral scope		Technical code
1	Energy industries(renewable - / non-renewable sources)	<input checked="" type="checkbox"/> 1.1 Wind park, 1.2 Hydropower, 1.3 Solar energy
2	Energy distribution	<input type="checkbox"/>
3	Energy demand	<input type="checkbox"/>
4	Manufacturing industries	<input checked="" type="checkbox"/> 4.2 Energy efficiency/Waste heat/gas recovery in Petroleum industry
5	Chemical industries	<input type="checkbox"/>
9	Metal production	<input type="checkbox"/>
10	Fugitive emissions from fuels(solid, oil and gas)	<input type="checkbox"/>
11	Fugitive emissions from production and consumption of halocarbons and sulfur hexafluoride	<input type="checkbox"/>
13	Waste handling and disposal	<input type="checkbox"/>

Approved by Qualification Committee of KFQ on 31 July 2009