



FINAL VALIDATION REPORT

**VALIDATION OF THE
MOKPO LANDFILL GAS RECOVERY PROJECT
FOR ELECTRICITY GENERATION
IN REPUBLIC OF KOREA**

REPORT No. 08-001
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ENVIRONMENTAL MANAGEMENT CORPORATION



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Approved by: Jong-Yeon Lee(Chairman of Deliberation committee)	Organisational unit: Environmental Management Corporation (EMC)	
Client: Hanwha Corporation	Client ref.: Ji-Hyun Park	
<p>Summary:</p> <p>This is final validation report prepared on the basis of UNFCCC criteria. Validation was prepared by concurrently carrying out desk review based on the project design document and relevant documents provided by the Hanhwa corporation (Project participant), onsite visit of Mokpo Landfill, interview with the stakeholder and technical experts and cross check through relevant information.</p> <p>Mokpo landfill gas recovery project for electricity generation was developed by Hanwha Corporation in Republic of Korea. Objectives of this project were to collect the CH₄ in the LFG from the landfill site as a renewable energy and to utilize CH₄ to generate electricity.</p> <p>Emission reductions is generated from the power generation using LFG in the Mokpo landfill, with total estimated reductions at 257,949 tCO₂e (for the crediting period: 10years), and annual average over the credit period of estimated reductions at 25,795 tCO₂e/y.</p> <p>As the result of the final validation, eight (8) Corrective Action Requests, twenty five (25) Clarification requests, one (1) Forward action request were corrected completely by Hanhwa corporation.</p>		
<p>Work carried out by: Seon-Gyoo Lee , In-Sik Yu, Hee-Kyung Kang , Suk-Hyun Jung , Jang-Hwan Cho</p>		<p>Service area Validation</p> <p>Market Sector Waste handling and disposal</p>
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Abbreviations

CAR	Corrective action request
CEF	Carbon emission factor
CER	Certified emission reduction
CH ₄	Methane
CL	Clarification request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
DNA	Designated national authority
EIA	Environmental Impact Assessment
EMC	Environmental management corporation
FAR	Forward action request
GHG	Greenhouse gas(es)
GWP	Global warming potential
MP	Monitoring plan
ODA	Official development assistance
PDD	Project design document



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1 INTRODUCTION

1.1 Objective

The purpose of validation is to ensure a thorough, independent assessment of proposed project activities submitted for registration as a proposed CDM project activity against the applicable CDM. This report includes the results of its assessment. Auditing is performed for general description, baseline selection, additionality, calculation of emission reductions, monitoring plan, crediting period, environmental impacts and stakeholder's comments refer to the Kyoto Protocol and CDM rules and modalities and related decisions by the COP/MOP, CDM Executive Board and host country criteria.

1.2 Scope

The scope of the validation is an independent and objective review of the project design document (PDD), and other relevant documents. The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology AMS-I.D (version13) "Grid connected renewable electricity generation" and AMS III.G (Version6) "Landfill methane recovery". EMC has employed a risk-based approach in the validation, focusing on the identification of significant risks for project implementation and the generation of CERs. The validation is not meant to provide any consulting towards the clients. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

1.3 GHG Project Description

The objective of the project is to install landfill gas (LFG) recovery system and construction of the 2.123 MW LFG power plant using gas engine. Thereby reducing greenhouse gas (GHG) emissions and generating tonnes of Certified Emissions Reductions (CER). The project is estimated to reduce 25,795 tCO₂e (tonnes of carbon dioxide equivalent) per year for the duration of the project activity. A reduction of approximately 257,949 tCO₂e is forecast for the fixed crediting period.



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2 METHODOLOGY

The validation apply standard auditing techniques (following CDM Validation and Verification Manual, version1) to assess the correctness of the information provided by the project participant.

Validation consisted of the following three phases:

- (a) Document review,
 - (i) Review of data and information
 - (ii) Cross checks between information provided in the PDD and information from sources other than that used
- (b) Follow-up actions (e.g., onsite visit, telephone, email interviews)
 - (i) Interview with relevant stakeholders in the host country
 - (ii) Cross-check of information provided by interviewed personnel
- (c) Resolution of outstanding issues and the issuance of the final validation report and opinion

The validation serves the following purposes:

- It organizes, details and clarifies the requirements the project is expected to meet
- It documents both how a particular requirement has been validated and the result of the validation.

The validation protocol consists of several tables. The different columns in these tables are described in figure1.

Findings established during the validation can either be seen as a non-fulfilment of validation protocol criteria or where a risk to the fulfilment of project objectives is identified. Corrective Action Requests (CAR) are issued, where:

- (a) The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reduction;
- (b) The CDM requirements have not been met;
- (c) There is a risk that emission reductions cannot be monitored or calculated.

Clarification request (CL) used where information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met. And Forward action request (FAR) used during validation to highlight issues related to project implementation that require review during the first verification of the project activity.

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Validation Protocol Table 1: Mandatory Requirements			
Requirement	Reference	Conclusion	Cross reference
<i>The requirements the project must meet.</i>	<i>Gives reference to the legislation or agreement where the requirement is found.</i>	<i>This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) of risk or non-compliance with stated requirements. The corrective action requests are numbered and presented to the client in the Validation report.</i>	<i>Used to refer to the relevant checklist questions in Table 2 to show how the specific requirement is validated. This is to ensure a transparent Validation process.</i>

Validation Protocol Table 2: Requirement checklist				
Checklist Question	Reference	Means of verification (MoV)	Comment	Draft and/or Final Conclusion
<i>The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in seven different sections. Each section is then further sub-divided. The lowest level constitutes a checklist question.</i>	<i>Gives reference to documents where the answer to the checklist question or item is found.</i>	<i>Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.</i>	<i>The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached.</i>	<i>This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) due to non-compliance with the checklist question (See below). Clarification is used when the validation team has identified a need for further clarification.</i>

Validation Protocol Table 3: Resolution of Corrective Action and Clarification Requests			
Draft report clarifications and corrective action requests	Ref. to checklist question in table 2	Summary of project owner response	Validation conclusion
<i>If the conclusions from the draft Validation are either a Corrective Action Request or a Clarification Request, these should be listed in this section.</i>	<i>Reference to the checklist question number in Table 2 where the Corrective Action Request or Clarification Request is explained.</i>	<i>The responses given by the Client or other project participants during the communications with the validation team should be summarised in this section.</i>	<i>This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".</i>

Figure 1 Validation protocol tables



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2.1 Documents Review

The Project Design Document (PDD) submitted by project participant and additional background documents were reviewed. And the following table outlines the documentation reviewed during the validation.

Documents provided by the project proponent that relate directly to the project:

- (a) Hanwha Corporation, CDM-PDD of the “Mokpo landfill LFG recovery to electricity generation project” version 00, Dated 9 December 2008
- (b) Hanwha Corporation, Economic analysis LFG capture and power generation, Dated 22 April 2009
- (c) Hanwha Corporation, CER and EF estimation, Dated 22 April 2009
- (d) Contract between Hanwha Corporation and Mokpo city / Contract between Hanwha Corporation and Sejin eng / Contract among Sejin eng, Ecoeye and Mokpo city, Dated 9 December 2008, 8 January 2009
- (e) Internal decision documents by the Board of Directors, Chairman, audit team for the project, Dated 9 January 2009
- (f) Hanwha Corporation, CDM-PDD of the “Mokpo landfill LFG recovery to electricity generation project” version 01, Dated 17 January 2009
- (g) Technical description document, Genset, JGS 320 GS-C81, Generator, Dated 17 January 2009
- (h) Technical description document, Genset, JGS 320 GS-L.L, Generator, Dated 22 April 2009
- (i) Gas mass flow measurement & control instrumentation, Eldridge products INC, Dated 17 January 2009
- (j) Quotation of flow meter(by Flow technology Co.,LTD, Eldridge products INC) , Dated 17 January 2009
- (k) Hanwha Corporation, CDM-PDD of the “Mokpo landfill LFG recovery to electricity generation project” version 02, Dated 2 February 2009
- (l) Quotation of gas analyzer system(by Huji instrument korea), Dated 13 March 2009
- (m) Sunchun internal power consumption data 2008, Dated 13 March 2009
- (n) Hanwha Corporation, CDM-PDD of the “Mokpo landfill LFG recovery to electricity generation project” version 03, Dated 20 April 2009
- (o) Hanwha Corporation, CDM-PDD of the “Mokpo landfill LFG recovery to electricity generation project” version 04, Dated 27 November 2009



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Background documents related to the design and/or methodologies employed in the design or other reference documents:

- (a) Clean Development Mechanism PDD Form (CDM-SSC-PDD), 22 December 2006
- (b) AMD III.G/Version 06
- (c) AMD I.D/Version13
- (d) Guidance on the demonstration and assessment of prior consideration of the CDM, Version 01, 2 August 2008
- (e) CDM EB, Tool for demonstration and assessment of additionality, Version 05.2
- (f) CDM EB44 Annex03, Clean Development Mechanism Validation and Verification Manual, Version01, 28 November 2008
- (g) International Emission Trading Association (IETA) & the World Bank's Prototype Carbon Fund (PCF): Validation and Verification Manual
- (h) National Waste Control Act, Ministry of Environment
- (i) National survey result for landfill treatment system, Ministry of Environment, June 2007
- (j) 2006 Status of national waste generation and treatment, Ministry of Environment, 2007 [registration number: 11-1480523-000003-10]
- (k) 2008 Facility by Electric Power source, KPX, June 2008
- (l) Statistics of Electric Power in Korea, KEPCO, May 2008 [registration number: 2008-08460528-Jung 0001]
- (m) Mokpo Landfill site map
- (n) IPCC Guidelines for National Greenhouse Gas inventories, 2006, Vol.5
- (o) Status of Landfill LFG reusing facilities and technologies, Sudokwon Landfill management corp., May 2006
- (p) Ho-chul Shin, Jin-Won Park, Ho-Seok Kom, Eui Soon Shin, Environmental and economic assessment of landfill gas electricity generation in Korea using LEAP model, Energy Policy 33 (2005) 1261-1270
- (q) Ministry of Environment report, The validity investigation and basic project report for Sudokwon landfill gas to energy project (in Korea), 2000
- (r) Ministry of Environment report, Utilization scheme of landfill gas to energy project as the Clean Development Mechanism (CDM) business. Sangwon Enc, 2001
- (s) U.S. EPA Landfill Methane outreach program, Landfill gas energy cost model, LFGcost, Version1.4 summary report Appendix 4-A Electricity case studies, 15 Dec 2008
- (t) LFG Energy project development handbook, EPA

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2.2 Follow-up Actions

In the period of validation, EMC performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the documents review. The main topics of the interviews are summarised in Table1.

Table 1 Main topic of Interview

Interviewed organization	Interview topics
Hanwha Corporation and Trade <ul style="list-style-type: none"> - Mr. Cheon-Chae Jeong - Ms. Ji-Hyun Park - Ms. He-Young Yang 	<ul style="list-style-type: none"> - General aspects of the project - Legal aspects of the project - Project boundary - Technical details of the project realization - Involved personnel and responsibilities - Monitoring and measurement equipment - Contribution to sustainable development - Additionality - Baseline methodology - Calculation on GHG emission - License, operation & maintenance authority and responsibility - QA/QC procedure - Monitoring Plan - Project management system - Duration of the project/Crediting period - Environmental impacts - Comments by local stakeholder, process - Approval by the host country
Eco Networks <ul style="list-style-type: none"> - Mr. Mun-Gu Lee - Ms. Jung-Ju Park 	<ul style="list-style-type: none"> - Procedural aspects - Additionality - Baseline study assumption and calculation - Details of emission reduction calculation - Monitoring Plan
State authorities (Mokpo City) <ul style="list-style-type: none"> - Mr. Tae-Ju Gong - Mr. Jong-In Kim 	<ul style="list-style-type: none"> - Compliance with existing and emerging regulations - EIA - Official local government funding provided for this type of project
National authorities (Ministry of Environment) <ul style="list-style-type: none"> - Mr. Jung-Sik Lee - Mr. Jang-Won Lee 	<ul style="list-style-type: none"> - Compliance with existing and emerging National regulation - Policy of sustainable development and climate change related to landfill - EIA



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	<ul style="list-style-type: none"> - Monitoring plan - CDM projects in Korea and the status for the current project - Official government funding provided for this type of project
Technical provider <ul style="list-style-type: none"> - Mr. Ki-Sung Im(Sejin eng) - Mr. Suck-Chul Oh(Sejin eng) 	<ul style="list-style-type: none"> - Selected technology to be installed - Continual monitoring equipment and selected process - Electricity generation permits, capacity basis - Operational lifetime of the project
Technical expert for landfill <ul style="list-style-type: none"> - Prof. Seng-Muk Lee(Seoul National Univ.) - Prof. Seong-Do Kim (Hallym Univ.) - Mr. Le-Bong Han (Sudokwon Landfill management corp.) 	<ul style="list-style-type: none"> - Cross check for PDD - Landfill waste filling rate statistics - General operation procedures - Growing rate data applied - PDD Preparation - CH₄ emission calculation/factor
Technical expert for project finance of LFG power generation <ul style="list-style-type: none"> - Mr. Byung-Chan Jo (Total E&S) - Mr. Le-Bong Han (Sudokwon Landfill management corp.) 	<ul style="list-style-type: none"> - Cross check for Project financing of LFG power generation (construction and O&M cost) - Aspects of LFG power generation in ROK - Incentive for renewable energy project such as the proposed project - Common landfill gas capture and utilization practices - Operational lifetime of LFG power generation plant

2.3 Resolution of Clarification and Corrective Action Requests

The objective of this phase is to resolve the requests for corrective actions, clarification, forward action and any other outstanding issues which needed to be clarified for EMC' positive conclusion on the project design. Eight (8) Corrective Action Requests, Twenty five (25) Clarification requests, One (1) Forward action request were identified by EMC in the initial validation. These requests were presented to the project participant in 5 January and 3 February, 2009. The project participants are requested to provide a response to the CARs, CLs and FAR listed in Table 3 of the Validation Protocol in Appendix A to this report.

2.4 Internal Quality Control

The technical review was performed by two technical reviewers qualified in accordance with EMC's qualification scheme for CDM validation and verification.



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3 VALIDATION FINDINGS

The findings from the documents review of the original project design documents (PDD) and the findings from follow-up actions (on site visit, telephone, email interview) are summarised. A more detailed record of these findings can be found in Appendix A.

3.1 Participation Requirements

- (a) The project participant : Hanwha Corporation
- (b) The host Party : Republic of Korea
- (c) Annex1 Party : No Annex1 Party has been identified yet (Unilateral CDM)

The host Party meets the requirements to participate in the CDM. Letter of Approval from the DNA of the Republic of Korea including authorization of the project participants and the Korean DNA's pending of confirmation (CAR1) that the project assists in achieving sustainable development in Republic of Korea is solved.

3.2 Project Design

The project is located in Mokpo landfill site in Mokpo City and developed by "Hanwha Corporation" in Republic of Korea. Objectives of this project were to collect the CH₄ in the LFG from the landfill site as a renewable energy and to utilize CH₄ to generate electricity.

The project is classified as a small-scale CDM project and the Scope are AMS.III.G, AMS.I.D.

The project boundary is a LFG collection system, pre treatment system and electricity generating system. The project design document does not clearly specify the technology of each process for recycling LFG effectively (CL1, CL2). One generator already installed in September 2008 and another generator will be installed with a total capacity of 2.123 MW (1.065MW +1.058MW) and is not likely to be replaced during the crediting period. The construction has started in 10 April 2008. So, according to CDM-Glos-04, the project is existed project activity. But no evidence provided (CAR8). After corrective action and clarify, CL1, CL2, CAR8 are closed

The electricity generated by project will be exported to a grid.

The project activity presents two kind of scenarios based on the currents local practices. But according to EMC's obtained data, Korea landfill site have two more alternatives (open-air burning, LFG reusing system) (CAR7). After corrective action, CAR7 is closed

The project is expected to contribute towards sustainable development through helping to dispose of the flammable constituents, particularly methane, safely and to control odor nuisance, health risk and adverse environmental impact and increase employment opportunities for local communities.

No public funding is involved and the validation did not reveal any information that indicates that the project can be seen as a diversion of ODA funding towards.



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3.3 Baseline Selection

The project applies the two approved simplified baseline methodology for small-scale CDM project activities. One is AMS-I.D (Version13) – “Grid connected renewable electricity generation” for Type I (Renewable energy projects) and the other is AMS-III.G (Version6) – “Landfill methane recovery” for Type III (Other project activities). The project fulfils the conditions under which AMS-I.D, AMS-III.G are applicable. The annual emission reduction is approximately 25,795 tonnes of CO₂ equivalent, which is less than the 60kt CO₂e/y methodology threshold.

The total methane emissions in the absence of the project activity were estimated based on the waste tonnage of the landfill using the “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site (Version4)”.

CO₂ emissions from burning of LFG for electricity generation are considered carbon neutral and hence not considered project emissions. However, Energy is used for start-up and for normal operation. The project emission calculations do not take the external energy consumption into account. Justification needs to be provided (CL8). After clarify, CL8 is closed

The baseline has been selected as continuation of current situation, i.e. LFG would be release into the atmosphere. Mokpo landfill site comply with national law in PDD, But it's not correct information (CAR2). According to the National Regulation, do not indicate any specific amount of gas collection and destruction or utilization of landfill gas. In practice, no registered amounts of landfill gas are actually burnt at Mokpo landfill; only a passive venting system is currently used to comply with National regulation (Waste Control Act, Ministry of Environment). Because no methane destruction is occurring in the baseline scenario, an AF of 0% was adopted. But this has not been specifically address in the PDD (CL4). Regulation “Waste Control Act, Ministry of Environment” defines the specification for environmental protection from the selection, design, construction and operation, monitoring and closure of final disposal sites for urban and special solid waste. This comprehensive regulation defines guidelines for the construction and operation of landfills, and also provides guidance regarding LFG, including recommendations for the collection, utilization and/or flaring of the LFG. However, the regulation does not specify minimum requirements regarding the amount of gas to be collected and utilized or flared. After corrective action and clarify, CAR2, CL4 are closed.

The “Tool for demonstration and assessment of additionality (version 05.2)” state that only laws that are enforced need to be considered in the determination of the baseline scenario as below;

Sub-step 1b: consistency with mandatory laws and regulations:

- (3) If an alternative does not comply with all mandatory applicable legislations, then show that, based on an examination of current practice in the country or region in which the law or regulation applies, those applicable legal or regulatory requirements are systematically not enforced and that*



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noncompliance with those requirements is widespread in the country. If this cannot be shown, then eliminate the alternative from future consideration;

“Waste Control Act” is a National law that given the sovereignty of local authorities (Mokpo city) in this area (landfills are within the responsibility of the municipalities) only becomes legally binding if it is adopted by the local authorities. So far, the most part of local authorities have not adopted this law. According to the findings of EMC, although all of 252 landfills in operation in Korea, with the exception of 26, comply with the Law that requires installation of venting system similar to that for Mokpo landfill; only some of these are complying with the utilization and/or flaring of the LFG. Although the “Waste Control Act” has regulations that need to be complied with, it does not have penalty regulations. With regards to reasons for the failure to utilize and/or flare the LFG, Participant and Mokpo City stated that LFG utilization without CDM is not profitable and flaring of the LFG has high risk of forest fire since the area surrounding the landfill is mountainous area. Risk of forest fire was verified through on-site visit. So, “Waste Control Act” has more the character of a policy.

It was cross-checked through the regular inspection report (2008.1) on landfill facility conducted by the Korea Rural Corporation (Public auditor). Interview with the personnel who drafted the regular inspection report revealed that landfill was acknowledged to possess treatment facility (Waste Control Act) even if the facility possessed only the venting system without gas combustion, power generation or conversion into resources. Accordingly, EMC, based on additionality, hereby acknowledged that the Waste Control Act of Republic of Korea has not been enforced systematically.

In order to determine the combined margin (CM) emission factor, option (a) simple OM and option1 BM were chosen.

3.4 Additionality

The additionality of the project is demonstrated, through an analysis of barriers, by applying the Attachment A to the Appendix B of the simplified modalities and procedures for CDM small scale project activities.

- (a) *Investment barriers:* A benchmark analysis has been selected and financial indicator which chosen are IRR and NPV. As a result of economical analysis and sensitivity analysis, NPV is lower than 0. EMC is able to confirm that it does not have economical attraction. But according to the detailed project financial calculation in the form of excel sheets which was provided from participant, the averaged operation and management cost considered is 572,100 won/y. But no evidence was provided in excel sheets and PDD. So, it needs to be clarified (part of CAR4). After clarify, CAR4 is closed



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EMC has validated the accuracy of the financial calculations carried out for the investment analysis, the suitability of the benchmark and the input parameters, in line with the CDM VVM, paras. 109-110, and 112:

Hanwha Corporation invests the total amount of capital, and it was calculated using a project IRR. EMC validate eligibility focused on consistency/conservativeness/reliability between PDD (with spreadsheet) and FSR (2008.2). EMC cross checked using an expert interview and researched data. EMC validated the appropriateness of the values in PDD and FSR when inconsistencies occur, in line with the CDM VVM, Para. 111 (b). Detailed validated activities are as below

(a) Total amount of investment cost

- EMC carried out analysis to validate appropriateness of the values in FSR. Lack of detail data for investment cost, EMC requested estimated calculation sheet to technical provider, and double checked each parameter.
- EMC performed investment analysis for similar domestic Landfill electricity generation project using "Status of Landfill LFG reusing facilities and technologies"¹⁾ to cross-check.
 - Total amount of investment cost for Mokpo landfill was lower than Pohang and same with Jeju. Both of them are landfills that have a same electricity generation capacity.
 - The total amount of investment cost for other project which has a different scale was similar with Mokpo.

Table 2. The comparison of total amount of Investment cost with capacity

Landfill site		Capacity	Total amount of Investment cost (Million won)
Project	Mokpo	2MW	3,000
Bench-mark project	JeJu	2MW	4,000
	Pohang	2MW	3,000
	Sunchun	1.8MW	2,500
	Sudokwan	6.5MW	10,300
	Sudokwan	3.38MW	4,600
	Sudokwan	50MW	77,300

¹⁾ Sudokwon Landfill Management Corporation, "Status of Landfill LFG reusing facilities and technologies", May 2006

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	Busan	8.7MW	6,000
	Gwangju	1MW	2,919
	Daejun	3.4MW	6,418
	ChungJu	1MW	1,650

- EMC conclude that the total amount of investment cost for Mokpo landfill in FSR and PDD was generally reasonable.
- In related with Sensitivity analysis, much of construction cost was already paid, and the rest of them is predictable, so total amount of cost is less likely happen to decline. Also construction cost has a high possibilities to increase because of increasing of raw materials price. EMC cross-checked with domestic company²⁾ who is running landfill electricity plant. After interview and cross-check, EMC conclude that there are low possibilities it will cross the bench-mark ratio(5.24%) because decline of investment cost.
 - EMC interviewed with domestic company and there was an opinion about landfill construction cost which OM cost has been rosed rapidly because of increasing of raw materials price.
 - EMC also cross-checked using a statistical data from Bank of Korea³⁾. Increasing ratio for imported materials was keep rising from Oct 2007. It was 7.5% at Oct 2007, Dec 15.6%, Jan 21.2% 2008, Feb 22.2% 2009. Statistical analysis data on prices from Bank of Korea predict that prices has a strong tendency to rising.

(b) Operation and management cost

- EMC cross-checked with the average O&M costs of USA 3MW cases are 13.2-16.4% of construction cost⁴⁾⁵⁾. So the O&M costs of this project was little bit higher (19%) than USA case. Considering of "Economies of scale", O&M Costs of this project (2MW) was reasonable, but more cross-check was needed.
- EMC requested evidence for O&M costs and validate appropriateness for each parameters.
 - Project participant, Hanwha Corporation need to pay Mokpo city 6.3% of electricity generation profit as a payment fee⁶⁾. Excluding payment fee to Mokpo city, O&M costs ratio is 16.3% and it is generally reasonable according to US EPA document.

²⁾ Mr. Byung-Chan Jo, Total E&S

³⁾ Bank of Korea, "statistical analysis data on prices" www.bok.or.kr

⁴⁾ U.S. EPA "Landfill Methane outreach program, Landfill gas energy cost model, LFG cost, Version 1.4 summary report Appendix 4-A Electricity case studies", 15 Dec 2008

⁵⁾ Table4-1 of LFG energy project development handbook, EPA

⁶⁾ Contract between Mokpo city and Hanwha



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- EMC cross-checked generator repair cost and engine oil exchange cost using a maintenance schedule which was submitted by GE energy agency. Generator repair cost was 122,500,000 won per 1.065MW. And engine oil need to be changed 14.6 times totally for every 600hours and 1,200,000 won for each time.
- Capturing pipe expenses is for nine wellhead extension constructions and repair cost for landfill. This expenses was came from operational experience of Sejin company which is a technical provider for this project. EMC cross-checked using a relative report "Status of Landfill LFG reusing facilities and technologies" and it was reasonable.
- Pre-treatment cost is to purchase desulfurize agent and filter. It was estimated by Sejin and came from it's operational experience. EMC cross-checked using a relative report "Status of Landfill LFG reusing facilities and technologies", and it was reasonable.
- Salary for operator is 25,000,000 won per year. EMC cross-checked using an average salary data from Korea Engineering & Consulting Association⁷⁾ and it was resonable
 - Annual salary for a primary grade skilled worker is 22,400,000won/year and the minimum salary is 20,000,000 won/year from Korea Engineering & Consulting Association based on 2007. So annual salary was reasonable.
- Apply 5% for welfare cost to annual salary and there are no regulation or policy for welfare cost. Because 5 to 10% rate is general range for welfare cost in Republic of Korea, So it is reasonable.
- There were no standardized cost for Postage, Office supplies, Mobile maintenance but EMC cross-checked using other contract documents that those are generally reasonable cost in Republic of Korea.
- Local tax is a rental fee for public property, and payment fee is a landfill gas utilization charge which it need to be paid to Mokpo city for 6.3% of the total sales of electricity. EMC cross-checked using a contract between Mokpo city and Hanwha.
- Insurance cost is a general fire insurance fee and it was 8,000,000 won for each generator come from company standardized regulation. EMC cross-checked with other project and conclude that it is reasonable.
- In related with sensitivity analysis, OM cost had a high possibilities to increase because of increasing of raw materials price. EMC cross-checked with domestic company who is running landfill electricity generation plant. After interview and cross-check, EMC conclude that there are low possibilities it will cross the benchmark ratio(5.24%) because decline of investment cost.
 - EMC interviewed with domestic company and there was an opinion about landfill construction cost, OM cost has been rosed rapidly because of increasing of raw materials price.

⁷⁾ Korea Engineering & Consulting Association (www.kenca.or.kr) "Average salary data for Engineering"



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- EMC also cross-checked using a statistical data from Bank of Korea. Increasing ratio for imported materials was keep rising from Oct 2007. It was 7.5% at Oct 2007, Dec 15.6%, Jan 21.2% 2008, Feb 22.2% 2009. Statistical analysis data on prices from Bank of Korea predict that prices has a strong tendency to rising.

(c) Unit price of electricity sales (SMP)

- Unit price of electricity sales was 81.5 won/Kwh in PDD. Project participant submit sperad sheet as an evidence and EMC cross-checked SMP using a data from Electricity exchange statistics system⁸⁾.
- Unit price of electricity sales is 100 won/Kwh in FSR and it was differ from PDD. According to CDM VVM para 111.(b) the values used in the PDD and associated annexes are fully consistent with the FSR, and where inconsistencies occur the DOE should validate the appropriateness of the values.
- Unit price of electricity sales in FSR is rough assumption data that doesn't have a benchmark or evidence. EMC conclude that it is not appropriate and accuracy value according to CDM VVM para 109. Even if the unit price of electricity sales was 100 won/Kwh, NPV was still negative value. EMC admitted that using 100 won/Kwh is not appropriate. Because of that reason EMC admitted that using a 81.5 won/Kwh rather than 100 in PDD which is a real unit price of electricity sales at that time was appropriate.
- EMC conclude that it is reasonable for setting a same unit price of electricity sales through whole project lifetime because of high uncertainty of future assumption. EMC carried out linear regression analysis using a publically opened data from 2001 to 2007⁹⁾ to estimate the possibility of increasing. Average unit price of electricity sales is 122 won/Kwh during project lifetime, and IRR is -1.37% which is much smaller figure than benchmark ratio (5.24%). Unit price of electricity sales should be over 140.3won/Kwh to be economically attractive and IRR will cross the benchmark ratio.
- There are low possibilities of decreasing for total investment cost, O&M cost, So there are no synergistic effects to increasing unit price of electricity sales. Because above reason, EMC concluded that sensitivity analysis performed appropriately.

⁸⁾ <http://epsis.kpx.or.kr>

⁹⁾ Electricity exchange statistics system (<http://epsis.kpx.or.kr>)

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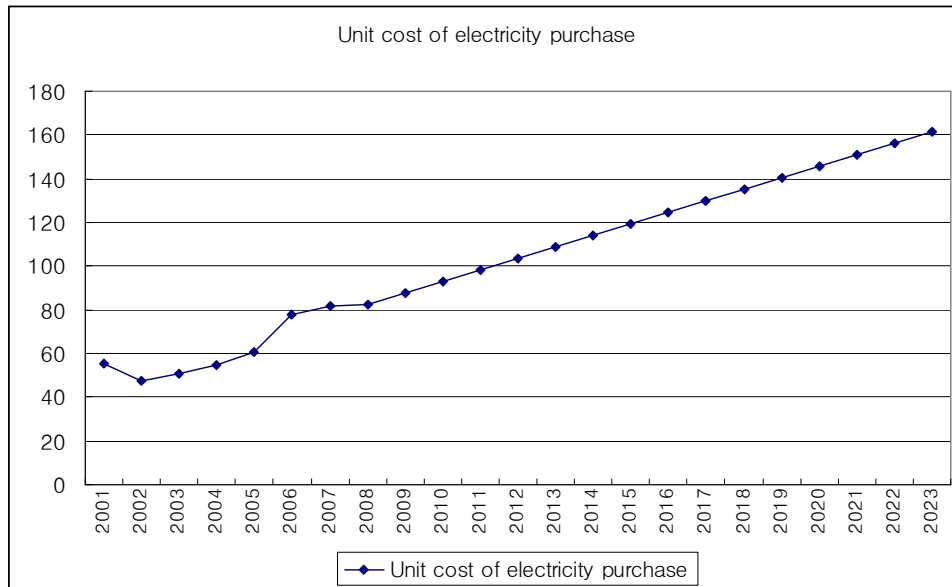


Figure 2. Linear regression analysis using a unit cost of electricity purchase

(d) Corporation Tax

- When profit from electricity generation sale is over 100,000,000 won, Project participant need to pay 25% corporation tax by legal standard. EMC cross-checked with National Tax Service¹⁰⁾.

(e) Depreciation period

- Operational lifetime for equipment was 15 years and this parameter was validated other section as a CAR 6, So Setting 15 years as a depreciation period was appropriate.

(f) Sales volume of electricity (MWh)

1) Maximum limit of LFG input into generator

- Gas volume based on full load situation is between 522 and 450 Nm³/hr. And PDD describe Gas volume as a 16.20 m³/min. EMC converse gas volume unit from Nm³/hr to m³/min and 16.20 m³/min was appropriate, also cross-checked with a generator specification report from GE Energy.

¹⁰⁾ www.nts.go.kr



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2) Fraction of methane in LFG

- PDD suggest 50% for fraction of methane in LFG based on Vol.5, Chapter3, IPCC Guideline 2006 and EMC check the guideline and concluded that it is appropriate.

3) Self-consumption ratio

- There were no back data for 3% self-consumption ratio. EMC requested evidence or related document. Project participant submitted self-consumption data for 1.065MW facility which was test running at that time. And self-consumption ratio for that was between 2.6 and 2.7%. So choosing a 3% for self-consumption ratio is conservative approach and reasonable.

4) Methane density

- EMC cross-checked Methane density using an ACM0001(page3), at standard temperature and pressure (0 degree Celsius and 1,013 bar), the density of methane is 0.0007168

5) Operation time

- Operation hour is same with FSR and spreadsheet which is 8000 hours. It is operation hour except shut down hour for maintenance which is 760 hours

Table 3. The comparison of operational hours

Project Name	Operational Hours
Mokpo	8000
Biogas Technology Group Ras Al-Khaimah Landfill Gas to Energy Project	8000
Landfill Gas Recovery and Utilization at Bukit Tagar Sanitary Landfill, Hulu Selangor	7884
Alton Landfill Gas to Energy Project	7972

(g) Benchmark ratio

- PP used 5.24% as a benchmark ratio for Mokpo project. Chinese NDRC published and approve benchmark ratio officially for each project type. In contrast with China there is no approved national authorized benchmark ratio for each project in Republic of Korea.
- So, most of domestic CDM projects are using average government bond or AA-Corporation bond as a benchmark ratio in Republic of Korea. Recent three years average data for AA- Corporation bond was 5.7 and 5.24 for government bond.

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Choosing a 5.24% which is a government bond is a conservative approach, EMC cross-checked using statistical data from bank of Korea¹¹⁾, so it is reasonable.

No other barriers are presented. Given the above barrier the project faces, it is sufficiently demonstrated that the project is not a likely baseline scenario, and emission reduction from the project can be considered additional.

3.5 Calculation of Emission Reduction

The baseline calculations are according to the simplified methodologies for category I.D, III.G small scale CDM project activities

The FOD (first order decay) model based on the discrete time estimate method of the “Tool to determine methane emission avoid from dumping waste at a solid waste disposal site”, as described in category AMS-III.G, is used to determine estimated emissions reductions ex ante. But it is not clear what DOCj, f, Kj, Wj.x, DOC, Existing waste amount have been used for the project activity. Correction needs to be provided in PDD. (part of CAR4)

And the calculations of project emissions related to the electricity consumption are established according to paragraph 9, option (a), AMS-I.D v.13, of the combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM). For the calculation of the OM, option (a) simple OM was utilized. The values calculated for CM is 0.5351 tCO₂/MWh. but 0.5375 tCO₂/MWh was chosen in PDD. Correction needs to be provided in PDD. (part of CAR4)

The project emissions are considered zero as the CO₂ emissions from burning of LFG for electricity generation are considered carbon neutral. The PDD does not clearly indicate if there is any fuel being used for start-up of the generation equipment and for pre-treatment equipment. (CL8)

Data and assumption which was using calculation of emission reduction are not provided in PDD. (CAR8) And uncertainty in the project emissions were not estimated properly addressed. (CL21) Participant needs to provide more data and evidence. (CL20, CL8)

All the assumptions and data used by the project participant are not listed in the PDD (CAR5).

The PDD estimated amount of GHG emission reductions from the project is 253,576 tCO₂e (in PDD version 01) during the first crediting period (10 years), resulting in estimated average annual emission reduction of 25,358 tCO₂e. But also this data need to be recalculated. (CAR4)

After corrective action and clarify, all of CL, CAR are closed

During the period for request for review for the project activity, EMC cross-checked PDD and relative document thoroughly again and find a mistake when calculating BE_{CH₄, SWDS, y} in emission reduction calculation spreadsheet. While updating spreadsheet, linked a wrong data in calculation spreadsheet. EMC verified revised PDD version 4 and BE_{CH₄, SWDS, y} have now been correctly linked in calculation spreadsheet.

¹¹⁾ Bank of Korea, Statistical data on bond, www.bok.or.kr

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EMC has validated the the calculation of the ex-ante emission reductions, in particular, that the values of the parameters for the application of the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site" are appropriate, and how the CAR raised related to these parameters were closed, in line with the CDM VVM, paragraphs 38-39:

Project participant used same estimation equation from "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site" in spreadsheet(Attached excel sheet when request for registration). After checking the equation, EMC validate the appropriateness for each parameter.

$$BE_{CH_4,SWDS,y} = \varphi \cdot (1-f) \cdot GWP_{CH_4} \cdot (1-OX) \cdot \frac{16}{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^y \sum_j W_{j,x} \cdot DOC_j \cdot e^{-k_j(y-x)} \cdot (1 - e^{-k_j}) \quad (1)$$

(a) φ

- Project participant used 0.9 and is correspondence with tool. EMC didn't comment about this in validation report because It is not related with CAR/CI.

(b) f

- First of all, there is a misprint in page A-35 of Validation report Appendix A. EMC submit revised validation report from F to f. It was caused automatically conversion by MS word programs. EMC correct this in revised validation report.
- Project participant used AMSIII-G ver.4 so EMC request to Project participant to using it's latest version which is Ver.6. According to AMSIII-G ver.6 page2, when no methane is captured and flared f is 0.
- EMC received "Letter of Approval for the Treatment Facilities issued by Chonnam Province to Mokpo City" from Project participant and cross-checked Mokpo landfill site didn't have any treatment except biological treatment facilities for leachate.
- EMC cross-checked using a regular examination report (2008.1) on landfill facilities carried out by Korea Rural Corporation and confirmed Mokpo landfill site didn't have any treatment system such as flared or used in another manner.
- Also, there was no existing treatment facility for LFG when EMC visit the on-site.



Figure 3. Mokpo landfill pictures



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(c) OX

- According to "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site", OX factor for managed solid waste disposal sites that are covered with oxidizing material such as soil or compost use 0.1 and use 1 for other types of solid waste disposal sites. Project participant didn't submit relative document, but EMC validate it's appropriateness using an internal technical data base. And this is not related with CAR/CI, so there were no comment in validation report.
- To validate it's appropriateness, EMC surveyed on National relative law(National Waste Control Act, Ministry of Environment)¹²⁾. According to National Waste Control Act, it is mandatory to covered with soil in the managed solid waste disposal sites. EMC concluded that it is appropriate but carry out cross-checking the compliance rate additionally.
- EMC cross-checked compliance rate using a "2006 Status of national waste generation and treatment"¹³⁾ which was the latest version at that time. EMC could checked every landfill paid for the covering with soil. Also according to "National survey result for landfill treatment system"¹⁴⁾, all of the landfill paid huge amount of money for covering the landfill, and it was 26 million \$ at 2006
- At last, when EMC visit on-site, Mokpo landfill was fully comply with the law. So choosing 0.1 for OX is appropriate.

(d) F

- Project participant used default value 0.5 and it is correspondence with tool. EMC didn't comment about this in validation report because It is not related with CAR/CI.

(e) DOC_r

- Project participant used default value 0.5 and it is correspondence with tool. EMC didn't comment about this in validation report because It is not related with CAR/CI.

(f) MCF

- According to "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site", MCF factor for anaerobic managed solid waste disposal sites is 1.0, 0.5 for semi-aerobic managed solid waste disposal sites, 0.8 for unmanaged solid waste disposal sites and 0.4 for unmanaged shallow solid waste disposal sites. Project participant submit 1.0 for MCF factor.
- According to "National survey result for landfill treatment system" domestic landfill is anaerobic managed solid waste disposal sites.

¹²⁾ National Waste Control Act, www.me.go.kr

¹³⁾ Ministry of Environment, 2006 Status of national waste generation and treatment, 2007

¹⁴⁾ Ministry of Environment, National survey result for landfill treatment system, June. 2007



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- EMC interview with landfill experts¹⁵⁾ for cross-check that inside of domestic landfills is anaerobic condition because they cover with cover soil or other cover materials after disposal of waste.
- EMC also cross-checked using a "Letter of Approval for the Treatment Facilities issued by Chonnam Province to Mokpo City", on-site visit and expert interview. It was not related with CAR/CI, so EMC didn't comment about this in validation report.

(g) $W_{j,x}$

- Project participant divide raw materials into before and after 2005. EMC approved it's appropriateness based on prohibition law of direct disposal of food waste to landfill site¹⁶⁾. Composition of landfill waste changed significantly after 2005, so fraction of food waste is 0.
- EMC cross-checked with landfill statistics from the Ministry of Environment. EMC requested to change $W_{j,x}$ figure because it was differ with reference.
- Especially, Project participant define "others" as a textile. Because of difference between overseas categorization criteria and lack of domestic analysis standard, Project participant's assumption for others is not conservative and objective.
- Textiles, Garden&Park waste are conservative approach except completely matched waste type(Wood, paper/cardboard, Food waste, Glass, plastic, metal, other inert waste) by overseas categorization criteria and domestic analysis standard. Among them Garden&Park waste has lower DOC_j (20%) value than textiles, so choosing that is more conservative approach and Project participant changed to those data.

(h) DOC_j

- Project participant used wet waste value between the values for wet and dry waste. Project participant chooses the wet waste value for conservative approach. But there are no evidence and explanation for that.
- According to National Waste Control Act Annex11, the percentage of water content in the waste need to be under 85% when they goes into the landfill. It is hard to distinguish whether it is wet or dry only for National Waste Control Act. Because 50% of water content is general standard for dividing wet and dry. Also there were no characteristic analysis data for Mokpo landfill waste, EMC consider it is conservative for choosing a wet waste value for DOC_j .

(i) k_j

- Although Korea Meteorological Administration is the authorized institution for atmospheric statistics of Korea but Project participant submitted wrong name for same institution. So EMC requested to Project participant to correct the name of institution.
- Used data must be average based on long term statistics, there were no indication on the number of years have been measured given in PDD. For cross-check, EMC searched presented value and cross-checked as the 30 year average through

¹⁵⁾ Interview with expert form Total E&S and Expert from EMC

¹⁶⁾ Ministry of Environment, Prohibition law of direct disposal of food waste to landfill site, January. 2005



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verification with data from Korea Meteorological Administration web site¹⁷⁾. So EMC requested to add above information to the revised PDD version 4.

- According to statistical data from Korea Meteorological Administration, EMC conclude below:
 - MAT(Mean annual temperature) = $13.8 \leq 20$
 - MAP(Mean annual precipitation) = 1125.1
 - PET (Potential evapotranspiration) = 1164.2
 - MAP/PET = $0.966415 < 1$
- MAT value is smaller than 20, So it is Boreal and Temperate. When MAP/PET is smaller than 1, it is Dry in Boreal and Temperate.

(j) Calculation formula : existing waste amount

- There is a difference between Ministry of Environment and National Institute of Environmental Research published data related with the quantify of waste disposed to landfill. Project participant choose data from National Institute of Environmental Research and it is conservative approach because of lower emission reduction.
- EMC cross-checked using interview with local expert¹⁸⁾ and confirmed that statistical data might be differ from each other because of collecting method and calculation unit. And both data published from government agency. So EMC conclude for the conservative approach it is appropriate choosing a data from National Institute of Environmental Research which brings lower emission than the other.

3.6 Monitoring Plan

The project applies the approved monitoring methodologies AMS-I.D v.13 and AMS-III.G v.6. But motoring plan is not described clearly. (CL7)

The amount of landfill gas will be measured by flow-meter and methane fraction in the landfill gas will be measured by gas analyzer continuously. However, specifications of the flow meter, gas analyser had not been presented, and details of uncertainty and calibration had not been provided. (CAR3)

The responsibilities of monitoring, measurement and reporting have, however, not been clearly identified. (CL9, CL10) Also procedures have not been defined for training of personnel (CL11), emergency preparedness (CL12), calibration of the monitoring equipment (CL13), maintenance of monitoring equipment (CL14), uncertainty (CL16), internal audits (CL17), performance reviews (CL18), corrective actions (CL19). And procedures for monitoring, measurements and reporting also need to be identified (CL15).

There is no mention of how the temperature and pressure of the landfill will be measured, thereby requiring supplementation. If the analyser measures it simultaneously, then there is no need to install separate measurement apparatus.

¹⁷⁾ www.kma.go.kr

¹⁸⁾ Interview with Prof. Seng-Muk Lee, Seoul national University



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All parameters pertaining to the baseline emissions are being monitored such as the total amount of LFG combusted in the power plant, concerning leakage, no sources of emission were identified according to AMS-III.G v6.

After corrective action and clarify, all of CL, CAR are closed.

Further, explanation were requested during the period for request for review for the project activity where corrections were sought to include the monitoring of parameters in line with the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site". The parameters f (Fraction of methane captured at the SWDS and flared, combusted or used in another manner), W_x (Total amount of organic waste prevented from disposal in year x), $p_{n,j,x}$ (Weight fraction of the waste type j in the sample n collected during the year x), z (Number of samples collected during the year x), GWP_{CH_4} (Global Warming Potential (GWP) of methane, valid for the relevant commitment period) were incorporated in the PDD Version 4. The revised PDD version 4 has been verified and the following parameters have now been incorporated.

EMC has validated why the monitoring plan does not provide for the monitoring of (a) the required parameters under the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site"; and (b) methane emission that would be captured and destroyed to comply with national or local safety requirement or legal regulations ($MD_{reg,y}$)

(a) the required parameters under the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site"; and

1) f

- According to AMS III.G_version6, since there were no flaring facilities in project site, f is 0%. EMC request to Project participant to submit revised PDD after described about f in table and verified.

2) W_x , $p_{n,j,x}$, z

- Analysis on composition of Landfill, Mokpo city need to report to the Ministry of Environment every year. And according to those data Ministry of Environment publish "Status of waste disposal and treatment" for each landfill site.
- EMC cross-checked using a relative document from Mokpo city and a government officer interview for composition analysis method and period of analysis.
- The report related with composition analysis to Ministry of Environment follow procedure of National Waste Control Act. Project participant will use it's analysis data for calculation.
- Project participant suggested that they do not need monitoring methodology but they have to use nationally approved data. EMC validated it was appropriate at that time. But Project participant submitted revised PDD with W_x , $p_{n,j,x}$, z in table and EMC verified.

3) GWP_{CH_4}

- Project participant submitted revised PDD with GWP_{CH_4} in table and EMC verified.



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- (b) Methane emission that would be captured and destroyed to comply with national or local safety requirement or legal regulations ($MD_{reg,y}$)
- EMC validated at the time of the site visit that there was no LFG collection system (neither active nor passive) installed in the baseline scenario. Therefore it is justified that the Adjustment Factor is set at 0. In ACM0001_version 5 it is stated "In cases where regulatory or contractual requirements do not specify $MD_{reg,y}$ an "Adjustment Factor"(AF) shall be used and justified, taking into account the project context". Project participant applied 0% AF to the project since there are no regulatory or contractual requirements which specify $MD_{reg,y}$ and neither an active nor a passive LFG capturing system is installed in the site in the baseline scenario. This was validated by EMC during on-site visit and cross-checked using a "Letter of Approval for the Treatment Facilities issued by Chonnam Province to Mokpo City".
 - So, Mokpo project's $MD_{reg,y}$ is 0 because AF value is 0. EMC already cross-checked using CAR2, CL4. And it doesn't need to be in PDD when the value is zero. But Project participant submitted revised PDD with $MD_{reg,y}$ in table and EMC verified.

3.7 Crediting Period

The starting date of the project activity is 10 April 2008 and the expected operational lifetime of the project is 15 years. A fixed 10-year crediting period is selected, starting on 01 January 2009. But this seems not possible and will be modified (CL6). After clarify, CL6 is closed.

3.8 Environmental Impacts

Significant adverse environmental impact due to the project activity is not expected. An EIA is not required for setting up of a LFG power generation. According to the National EIA law, projects whose power capacity is more than 10MW shall be carried out the EIA. But this project is 2.123MW.

Although EIA is not enforcement for this project, project participant assessed possible environmental impacts caused by the project activity or landfill operation.

Landfill gas emissions will decrease, reducing greenhouse gas emissions and local impacts related to water pollution, noise & vibration and odour etc. However, with regards to the air pollution, there is need to additionally verify to what extent atmospheric pollutants are generated from the power generation facility (CL22), and also there is requirement to verify whether the law has been complied with. After clarify, CL22 is closed

Also, regarding after service for the project, project participant must update their regularization plan and delivered to the local environmental authority. This needs to be confirmed during verification. (FAR1)



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3.9 Stakeholder's Comments

Although local stakeholders have been announced through local newsletter and website designed for the stakeholders by the Mokpo City, and project seminar was held in November 2006 for the 42 stakeholders, the detailed document referred to in the PDD needs to be provided to EMC. (CL23)

After confirmation through additional information, CL23 is closed.

4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

The PDD of 19 January 2009 was published on the UNFCCC CDM website and Parties, stakeholders and NGOs were invited to provide comments on the validation requirement during a period of 30 days, from 23 January 2009 to 21 February 2009. And EMC didn't received any public comments.



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5 VALIDATION OPINION

The validation has been performed in accordance with the UNFCCC criteria for CDM and host country criteria, including the VVM (Validation Verification Manual, ver.1).

EMC carried out desk review of project design documentation, interview with the stakeholder and technical experts and onsite audit.

The host party is Republic of Korea, which fulfill the participation criteria. The DNA of Republic of Korea confirmed that the project assists in achieving sustainable development.

No public funding is involved and the validation did not reveal any information that indicates that the project can be seen as a diversion of ODA funding

The proposed project applies the approved baseline and monitoring methodology AMS - I.D(v.06), AMS-III.G(v.13). It is demonstrated that the project is not a likely baseline scenario.

Emission reductions attributes to the project are hence additional to any that would have occurred in the absence of the project activity. Considering that is the most feasible situation that proposed project will be implemented as designed, the project is likely to achieve the estimated amount of emission reduction.

In our opinion, this proposed CDM project activity, "Mokpo Landfill Gas Recovery Project for Electricity Generation", as described in the revised and resubmitted project design documentation dated 27, Nov 2009(v.04), meets all relevant UNFCCC requirements for CDM and relevant host country criteria. EMC thus will recommend the registration of the proposed project, "Mokpo Landfill Gas Recovery Project for Electricity Generation", as the CDM project activity.

17-February-2010

A handwritten signature in black ink, appearing to be 'Seon Gyoo Lee', is written over a light blue rectangular background.

Signature: _____

EMC Audit team Leader

Seon Gyoo Lee



FINAL VALIDATION REPORT

6. Validation team

Seon-Gyoo Lee, EMC, Republic of Korea, Lead Auditor

In-Sik Yu, EMC, Republic of Korea, Auditor

Hee-Kyung Kang, EMC, Republic of Korea, Auditor

Suk-Hyun Jung, EMC, Republic of Korea, Technical reviewer

Jang-Hwan Cho, EMC, Republic of Korea, Technical reviewer

The qualification of each individual validation team member is detailed as follows;

FINAL VALIDATION REPORT

Curriculum Vitae for Auditor

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2. Education/ Qualifications

Years	Attainment	Major	Degree
2009.2	EMC	CDM audit	Auditor
2008.11	Korea Eco-Products Institute	Carbon Declaration Product certification	Auditor
2005.11	Human Resources development service of Korea	Wastes Treatment	Professional Engineer Wastes Treatment
2002.11	Ministry of Environment	Environmental Declaration Product certification	Auditor
2005.8	University of Seoul	Environmental Engineering	Master's degree
1992.6	Human Resources development service of Korea	Chemical Industry	Engineer Chemical Industry
1988.2	University of Dongguk	Chemical Engineering	Bachelor's degree

3. Career

Years	Institution	Position
2008.10- present	GHG Certification Center, EMC	Director
2006.2-2008.10	Dept. of global environment, EMC	Manager
1998.2-2005.7	Technology Assessment Team, EMC	Manager
1996.2-1997.4	Environmental Declaration Product Certification team	Manager

4. Auditing

- Audit for Validation of CDM project (Mokpo LFG recovery to electricity project), 2008
- Audit for ISO14025 (Type3; Environmental declaration product certification), 2005-2006
 - 2006 Korea Water Resources Corp.
- Audit for assessment of new technology, 1997-2005
 - 1998 new technology of incinerator, Goryeo
 - 1999 new technology of incinerator, Daewoo Shipbuilding
 - 1999 new technology of composting, Junghan Development Co.,LTD.,
 - 1999 new technology of the generation of electricity by Anaerobic Digestion Tank, Dongmoon IRS Co.,LTD.
 - 2003 new technology of melting furnace using wastes, Dongbu HITek
 - 2003 new technology of sludge melting furnace, Institute for Advanced Engineering
 - 2004 new technology of recycling of construction wastes, Insun ENT
 - 2004 new technology of de-NOx catalyst, KOPEC
 - 2004 new technology of waste water treatment for remove N&P applying A2O process, Daewoo Construction Co.,LTD.
- the performance inspection of incinerator, 1994-1997

5. Related Training

- Audit training, A certificate for ISO14001 Auditor course, KSA, 2008.12
- Audit training, CDM auditor training course-KFQ, 2007.1
- Audit training, A certificate of training for GHG emission verification lead verifier-BSI, 2006.3

FINAL VALIDATION REPORT

Curriculum Vitae for Auditor

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2. Education/Qualifications

Years	Attainment	Major	Degree
2009.5	Korea Auditor Registration	KS Q ISO 14001:2004	Auditor
2009.2	EMC	CDM audit	Auditor
2007.3- present	University of Seoul	Climate change and health	course of Ph.D
2002.2	Korea University	Earth environmental Science	Master's degree
2000.2	Korea University	Earth environmental Science	Bachelor's degree

3. Career

Years	Institution	Position
2008.10- present	GHG Certification Center, EMC	Auditor
2006.3-2008.10	Dept. of global environment, EMC	Assistant manager
2002.9-2006.2	Climate change consulting team, Eco-frontier	Senior Consultant
2000.9-2002.8	Institute of Basic Sciences	Researcher

4. Auditing

- Audit for Validation of CDM project (Mokpo LFG recovery to electricity project), 2008

5. Related Training

- Audit training, CDM auditor training course, KFQ, 2007.1
- Audit training, A certificate for ISO14001 Auditor course, KSA, 2006.6
- Audit training, A certificate for The Lead Verifiers BSI Global best practice GHG Verification, BSI, 2004.1
- Audit training, A certificate of training for GHG emissions verification, DNV, 2004.6

FINAL VALIDATION REPORT

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2. Education/Qualifications

Years	Attainment	Major	Degree
2009.2	EMC	CDM audit	Auditor
2006.2	Yeungnam University	Environmental engineering	Master's degree
2004.2	Yeungnam University	Environmental engineering	Bachelor's degree
2002.6	Human Resources development service of Korea	water pollution	Engineer Water Pollution Environmental
2003.6	Human Resources development service of Korea	Air Pollution	Engineer Air Pollution Environmental

3. Career

Years	Institution	Position
2008.10-present	GHG Certification Center, EMC	Auditor
2007.2-2008.10	Dept. of global environment, EMC	Assistant manager
2005.3-2005.8	Yeungnam University	Teaching assistant
2005.9-2006.2	Yeungnam University	Research assistant

4. Auditing

- Audit for Validation of CDM project (Mokpo LFG recovery to electricity project), 2008

5. Related Training

- Audit training, A certificate of training for GHG emission verification lead verifier, BSI, 2008.7
- Climate Change Training, Expert training course, KFQ, 2007.12
- Climate Change Training, Business Imperative of Climate Change, BSI, 2007.3

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Curriculum Vitae for Technical experts

Sector	13	
Qualifications	Higher than senior level staff at an audit institution	
	Higher than senior level staff for climate change related works	
	Professor in climate change related area	O
Evaluator	Personnel in charge of qualification management	

1. Basic information

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2. Education/Qualifications

Years(From~Until)	Attainment	Major	Degree
2004.8.30	Human Resources development service of Korea	Water Environmental	Professional Engineer Wastes Treatment
1996.12.9	Human Resources development service of Korea	Wastes Treatment	Professional Engineer Water Environmental
2002.3.5-2004.8.24	University of Seoul	Environmental Engineering	Master's degree
1981.3.4-1988.2.15	GyeongSang National University	Agricultural Chemistry	Bachelor's degree

3. Career

Years (From~Until)	Institution	Position
'88.3.24-'91.11.15	HHI Corp. Civil Dept.	Assistant Manager
'91.11.16-present	Environmental Management Corporation	Team Manager

4. Related Training

5. Related research and business

- 1988.3.24-1991.11.15 : Construction of waste water treatment plants and landfills
- 1988.11.15-1995. 7 : Design and basic plans for landfills
- 1995.7-1996.7 : Working in the laboratory of Sudokwuon Landfill
- 1996.7-1997.7 : Working in the division of operation and maintenance of waste water treatment plant
- 1997.7-2005.10 : Inspection and diagnostic of landfills
- 2005.10-present : Direction for construction of water supply & sewerage system

FINAL VALIDATION REPORT

Curriculum Vitae for Technical experts

Sector	13	
Qualifications	Higher than senior level staff at an audit institution	
	Higher than senior level staff for climate change related works	
	Professor in climate change related area	O
Evaluator	Personnel in charge of qualification management	

1. Basic information

	Name	Cho, Jang Hwan
	Date of Birth	Jan. 18, 1970
	Nationality	Republic of Korea
	Address	Unit 1205 Bldg. 707 Jugong Apt., Gaepo-3-dong, Kangnam-gu, Seoul
	Tel	032-560-2468
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2. Education/Qualifications

Years(From~Until)	Attainment	Major	Degree
2002.8	Texas A&M University	Environmental Engineering - Wastes handling	Ph.D
1999.2	Kwangwoon University	Environmental Engineering	Master's degree
1997.2	Kwangwoon University	Environmental Engineering	Bachelor's degree

3. Career

Years (From~Until)	Institution	Position
2003.7-present	Environmental Management	Section Chief
2002.8-2003.7	National Institute of Environmental Research	Researcher

4. Related Training

5. Related research and business

Appendix A

Validation procedures (Check list)

Table 1 Mandatory Requirements for Small Scale Clean Development Mechanism (CDM) Project Activities

REQUIREMENT	REFERENCE	CONCLUSION	Cross Reference/ Comment
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3	Kyoto Protocol Art. 12.2	OK	The type of this project is Unilateral and no Annex1 has been identified.
2. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof	Kyoto Protocol Art. 12.2, Simplified Modalities and Procedures for Small Scale CDM Project Activities §23a	OK	Table 2, Section A.3/ The receipt of a written approval letter (LoA) from the DNA of Republic of Korea has been verified.
3. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC	Kyoto Protocol Art. 12.2.	OK	Table 2, Section B.6.1/ The project result in fewer GHG emissions than the baseline case
4. The project shall have written approval of voluntary participation from the designated national authorities of each party involved	Kyoto Protocol Art. 12.5a, Simplified Modalities and Procedures for Small Scale CDM Project Activities §23a	OK	Table 2, Section A.3/ The receipt of a written approval letter (LoA) from the DNA of Republic of Korea has been verified.
5. The emission reductions should be real, measurable and give long-term benefits related to the mitigation of climate change	Kyoto Protocol Art. 12.5b	OK	Table 2, Section B
6. Reduction in GHG emissions must be additional to any that would occur in absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity	Kyoto Protocol Art. 12.5.c, Simplified Modalities and Procedures for Small Scale CDM Project Activities §26	OK	Table 2, Section B.2
7. Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance	Marrakech Accords (Decision 17/CP.7)	OK	No public funding is involved
8. Parties participating in the CDM shall designate a	CDM Modalities and	OK	Prime Minister's Office is the DNA

REQUIREMENT	REFERENCE	CONCLUSION	Cross Reference/ Comment
national authority for the CDM	Procedures §29		of the republic of Korea. And organized at Jun. 2004
9. The host Party and the participating Annex1 Party shall be a Party to the Kyoto Protocol	CDM Modalities and Procedures §30, 31b	OK	The republic of Korea is a party to the Kyoto Protocol. Ratification date is Nov 8, 2002
10. The participating Annex1 Party's assigned amount shall have been calculated and recorded	CDM Modalities and Procedures §31b	OK	The type of this project is Unilateral and no Annex1 has been identified.
11. The participating Annex1 Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7	CDM Modalities and Procedures §31b	OK	The type of this project is Unilateral and no Annex1 has been identified.
12. The proposed project activity shall meet the eligibility criteria for small scale CDM project activities set out in § 6 (c) of the Marrakesh Accords and shall not be a debundled component of a larger project activity	Simplified Modalities and Procedures for Small Scale CDM Project Activities §12a,c	OK	Table 2, Section A.1
13. The project design document shall conform with the Small Scale CDM Project Design Document format	Simplified Modalities and Procedures for Small Scale CDM Project Activities, Appendix A	OK	CDM-SSC-PDD-Version03 (22 December 2006) is used for project activity
14. The proposed project activity shall confirm to one of the project categories defined for small scale CDM project activities and uses the simplified baseline and monitoring methodology for that project category	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22e	OK	Table 2, Section A.1.3 ,B and D/The project activity is confirmed to category I.D (Grid connected renewable electricity generation, Version 13) and category III.G (Landfill methane recovery, Version 6)
15. Comments by local stakeholders are invited, and a summary of these provided	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22b	OK	Table 2, Section E

REQUIREMENT	REFERENCE	CONCLUSION	Cross Reference/ Comment
16. If required by the host country, an analysis of the environmental impacts of the project activity is carried out and documented	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22c	OK	Table 2, Section D
17. Parties, stakeholders and UNFCCC accredited NGOs have been invited to comment on the validation requirements and comments have been made publicly available	Simplified Modalities and Procedures for Small Scale CDM Project Activities §23b,c,d	OK	The PDD has been published for public comments on the UNFCCC CDM website during a period of 30 days, from 23 January 2009 to 21 February 2009
18. Indicate whether the DOE received this letter from the project participants or directly from the DNA	CDM VVM version01 (EB44 Annex3)	OK	Table 2, Section A.3/ The receipt of a written approval letter (LoA) from the DNA of Republic of Korea has been verified.
19. If the DOE doubts the authenticity of the letter of approval, the DOE shall verify with the DNA that the letter of approval is authentic	CDM VVM version01 (EB44 Annex3)	OK	Departments in charge of DNA deliberation are the Ministry of Knowledge Economy and Ministry of Environment. Deliberation committee meeting was held for each Department, and government officials, technology expert and NGO participated in such meeting. In addition, there is no room for doubt on the authenticity as there was secondary cross checking procedure in which all the relevant departments reviewed the outcome of deliberation.
20. Confirm that no entities other than those approved as project participants are included in these sections of the PDD	CDM VVM version01 (EB44 Annex3)	OK	No entities other than approved as project participant (Hanwha Corporation) Verified through contract that

REQUIREMENT	REFERENCE	CONCLUSION	Cross Reference/ Comment
			Hanwha Corporation has the full ownership rights on CERs.
21. Indicate whether the participation has been approved by a party to the Kyoto Protocol	CDM VVM version01 (EB44 Annex3)	OK	Hanwha Corporation is Korea company. This is verified by Business Registration Certificate
22. Determine whether the PDD is in accordance with the applicable CDM requirements for completing PDD	CDM VVM version01 (EB44 Annex3), Guidelines for completing the CDM-SSC-PDD (Version 05)	OK	Table2
23. Contain a statement regarding the compliance of the PDD with relevant forms and guidance	CDM VVM version01 (EB44 Annex3), Guidelines for completing the CDM-SSC-PDD (Version 05)	OK	Table2
24. Describe the process undertaken to validate the accuracy and completeness of the project description	CDM VVM version01 (EB44 Annex3)	OK	Review of data, information provided by participants. And cross checks using expert interview and information from sources other than that used
25. Cross check the information provided in the PDD with other verifiable and credible sources, such as local expert opinion, if available	CDM VVM version01 (EB44 Annex3)	OK	Refer to 24
26. All the assumptions and data used by the project participants are listed in the PDD, including their references and sources	CDM VVM version01 (EB44 Annex3)	OK	Table2/B.4.8.
27. Assess and verify the reliability of all data, rationales, assumptions, justifications and documentation provided by project participants	CDM VVM version01 (EB44 Annex3)	OK	Table2
28. Confirm that the start date of the project activity, reported in the PDD, is in accordance with the "Glossary	CDM VVM version01 (EB44 Annex3), Guidance	OK	Table2/B.2.7.

REQUIREMENT	REFERENCE	CONCLUSION	Cross Reference/ Comment
of CDM Terms” and demonstrated that the CDM benefits were considered necessary in the decision to undertake the project as a proposed CDM project activity if the project activity start date is prior to the date of publication of the PDD for stakeholder comments	on the demonstration and assessment of prior consideration of the CDM annex46		

Table 2 Requirements Checklist

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A. Project Description The project design is assessed.					
A.1. Small scale project activity It is assess whether the project qualifies as small scale CDM project activity.					
A.1.1. Does the project qualify as a small scale CDM project activity as defined in paragraph 6 (c) of decision 17/CP.7 on the modalities and procedures for the CDM?	PDD /A.4. 2, B.2	DR/I	Power generation capacity (2.123MW) and quantity of reduction in greenhouse gas (25,795 tCO ₂ e/y) of the project comply with criteria for small capacity CDM project (AMS-I.D is less than 15MW, AMS-III.G is less than 60ktCO ₂ e).	OK	OK
A.1.2. The small scale project activity is not a debundled component of a larger project activity?	PDD /A.4. 5	DR/I	The proposed project satisfies the items of Appendix C of the Simplified Modalities and Procedures for Small scale CDM. Although Hanwha corporation (project participant) has 1 registered project (Catalytic N ₂ O Abatement Project in the Tail Gas of the Nitric Acid Plant of the Hanwha Corporation in Ulsan, Republic of Korea) that the company completed, since AM0028 was used and distance was more than 1km, there is no possibility of debundle with this project. There is no relevant project that has been completed or is under progress. This was cross-checked through interview between Hanwha Corporation and Mokpo City.	OK	OK
A.1.3. Does proposed project activity confirm to one of the project categories defined for	PDD /A.4.	DR	Yes. The project fulfil the conditions of Type III- other project activities, AMS-III.G-“Landfill Methane Recovery”, Type I-Renewable energy projects,	OK	OK

* MoV = Means of Verification, DR= Document Review, I= Interview

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
small scale CDM project activities?	2		AMS-I.D-“Grid connected renewable electricity generation”.		
A.2. Project Design Validation of project design focuses on the choice of technology and the design documentation of the project.					
A.2.1. Are the project’s spatial (geographical) boundaries clearly defined?	PDD /A.4. 1	DR/I	Yes. The project is located in Mokpo landfill is located in Deayang Dong, Mokpo city, Republic of Korea. The coordinates of the landfill site have a longitude of 34:48 N and latitude of 126:22 E.	OK	OK
A.2.2. Are the project’s system (components and facilities used to mitigate GHG's) boundaries clearly defined?	PDD /A.4. 2, B.6. 3	DR/I	<p>Yes. The project boundary is the landfill site which main process of the project is a LFG Collection system, Pre-treatment system, Electricity generation and grid connection system.</p> <p>However, according to ACM0001/verion10 CO₂ emissions resulting from the use of electricity in extracting, pumping and pre-treatment the landfill gas should be accounted as project emissions and included in the emission reduction calculations respectively.</p> <p>In PDD, Pre-treatment system consisted with CSV, heat exchanger, H₂S remove, gas filter, CH₄ analyzer and blower. But CH₄ analyzer is not clear in <Fig. A-3></p>	CI1	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A.2.3. Are the identified boundary and the selected sources and gases are justified for the project activity?	PDD /A.4. 2, B.6. 3	DR/I	YES	OK	OK
A.2.4. Does the project design engineering reflect current good practices?	PDD /A.4. 2	DR/I	<p>Technical data related to pre-treatment system, electricity generation system have not been addressed in the PDD.</p> <p>This confirmed on additional documents provided by participant and audit team, technical expert's interview.</p> <p>But we need more clarification for gas analyzer and the technical specification of the generator must be included in the PDD.</p> <p>This confirmed on additional documents provided by participant and it was corrected in version 02 of the PDD</p>	CI2	OK
A.2.5. Will the project result in technology transfer to the host country?	PDD /A.4. 2	DR/I	<p>Technological specification have not been addressed in the PDD</p> <p>This is confirmed on additional documents which are provided by participant.</p> <p>But the technical specification of the generator must be included in the PDD</p> <p>This confirmed on additional documents provided by participant and it was corrected in version 02 of the PDD</p>	CI5	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A.2.6. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies in the host country?	PDD /A.4. 2	DR/I	Technological specification have not been addressed in the PDD This is confirmed on additional documents which are provided by participant. The technology is considered state of art and as stated in equipment specifications this will result in significant better performance than BAU.	CI2	OK
A.2.7. Is the project technology likely to be substituted by other or more efficient technologies within the project period?	PDD /A.4. 2	DR/I	The project technology shall not be likely to be substituted by other technologies within the project period This is confirmed on interview with project participant and technical provider.	OK	OK
A.2.8. Does the project make provisions for meeting training and maintenance needs?	PDD /A.4. 2, B.7. 2	DR/I	The information of equipment suppliers contracts is not clearly defined in the PDD This is confirmed on interview with project participant and technical provider.	CI3	OK
A.3. Contribution to Sustainable Development The project's contribution to sustainable development is assessed					
A.3.1. Will the project create other environmental or social benefits than GHG emission reductions?	PDD /A.2, D.1	DR/I	Yes, the project bring below positive environmental or social impact. - Reducing risk of explosions and/or fires either within the landfill or outside its project boundary, - Significantly less harmful toxic effects to humans from concentrated emissions of LFG, - Reducing odour This is confirmed on interview with stakeholders and professor in local university and additional data which is gained by EMC.	OK	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A.3.2. Will the project create any adverse environmental or social effects?	PDD /A.2, D.1	DR/I	Yes, this is confirmed on interview with stakeholders and professor in the university	OK	OK
A.3.3. Is the project in line with sustainable development policies of the host country?	PDD /A.2	DR	Through receipt of a written approval letter(LoA) from the DNA of Republic of Korea, it is confirmed	CAR1	OK
A.3.4. Is the project in line with relevant legislation and plans in the host country?	PDD /A.2	DR/I	Through receipt of a written approval letter(LoA) from the DNA of Republic of Korea, it is confirmed Ans also this is verified on interview with national authorities (Ministry of Environment).	CAR1	OK
B. Project Baseline The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario. B.1. Baseline Methodology It is assessed whether the project applies an appropriate baseline methodology.					
B.1.1. Is the selected baseline methodology in line with the baseline methodologies provided for the relevant project category?	PDD /B.1	DR	Yes. The project adopts the approved methodologies as below - AMS I. D: Grid connected renewable electricity generation_V13 - AMS III. G: Landfill methane recovery_V6 - Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site_V4	OK	OK
B.1.2. Is the baseline methodology applicable to the project being considered?	PDD /B.1	DR	Yes. The baseline methodology is applicable for the project and the appropriateness is justified. The LFG is captured to generate electricity and the	OK	OK

* MoV = Means of Verification, DR= Document Review, I= Interview

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			emission reductions are claimed for displacing the electricity generation from grid. At the same time, the capacity of electricity generated is 2.123 MW less than 15 MW (the threshold for small scale projects)		
B.2. Baseline Determination It is assessed whether the project activity itself is not a likely baseline scenario and whether the selected baseline represents a likely baseline scenario.					
B.2.1. Is it demonstrated that the project activity itself is not a likely baseline scenario due to the existence of one or more of the following barriers: investment barriers, technology barriers, barriers due to prevailing practice or other barriers?	PDD /B.4, B.5	DR/I	The baseline has been selected as continuation of current situation, i.e. LFG would be released into the atmosphere through vertical wells. PDD need to be corrected for regulation, investment barriers, technology barriers, barriers due to prevailing practice. It was corrected in version 01 of the PDD	CAR2	OK
B.2.2. Is the application of the baseline methodology and the discussion and determination of the chosen baseline transparent and conservative?	PDD /B.6	DR/I	The current configuration at Mokpo Landfill comprises passive venting with no burning. This landfill gas venting system is used only for compliance of National regulation (according to Waste Control Act of Republic of Korea, venting system must be establish for gas treatment) and safety purposes. Because no methane destruction is occurring in the baseline scenario and the regulatory requirements do not indicate any specific amount of gas collection and destruction or utilization of landfill gas, an adjustment factor (AF) of 0% was adopted Clarification is needed why the Adjustment Factor	CI4	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			has determined as 0 %. It was clarified in version 01 of the PDD		
B.2.3. Are relevant national and/or sectoral policies and circumstances taken into account?	PDD /B.4, B.5	DR/I	Refer to B.2.1	OK	OK
B.2.4. Is the baseline selection compatible with the available data?	PDD /B.6	DR/I	Yes	OK	OK
B.2.5. Does the selected baseline represent the most likely scenario describing what would have occurred in absence of the project activity?	PDD /B.4, B.5	DR/I	Refer to B.2.1	OK	OK
B.2.6. Does the list of alternatives contains all plausible alternatives that the DOE, on the basis of its local and sectoral knowledge?	PDD /B.4,	DR	The goal of a LFG energy project is to convert LFG into a useful energy form, such as electricity, steam, vehicle fuel, or pipeline quality gas (LFG energy project development handbook, EPA) In Korea, four type of alternatives are used (during total 252of active landfill site, 226 of venting without gas treatment, 11 of gas flaring only, 14 of electricity generation and 1 of gas reuse). So PDD must include 2 more alternatives. It was corrected in version 01 of the PDD	CAR7	OK
B.2.7. Confirm that the start date of the project activity, reported in the PDD, is in accordance with the "Glossary of CDM Terms" and demonstrated that the CDM benefits were considered necessary in the decision to undertake the project as a proposed CDM project activity if the project activity start date is prior to the date of publication of the PDD for	PDD /B.4. 2	DR	According to CDM-Glos-04, the project is existing project activity. But the project participant should not provide sufficient information about prior consideration. The project participant should provide decision documents by the Board of Directors. Refer to Contract documents(including Sejin ENG vs Ecoeye vs Mokpo at 2007.4.10), decision documents by the Board of Directors of Hanhwa	CAR8	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
stakeholder comments			corporation and decision documents by the Directors Mokpo city, we confirmed. This issue include in deliberation point of Republic of Korea DNA, so we verified on written approval letter (LoA) from the DNA of Republic of Korea.		
B.3. Calculation of GHG emission It is assessed whether all material GHG emission sources are addressed and how sensitivities and data uncertainties have been addressed to arrive at conservative estimates of projected emission reductions. - Project GHG Emissions The validation of predicted project GHG emissions focuses on transparency and completeness of calculations.					
B.3.1. Are all aspects related to direct and indirect project emissions captured in the project design?	PDD /B.6. 3	DR/I	Emission from on-site electricity use was not addressed in PDD. According to ACM0001/verion10 CO ₂ emissions resulting from the use of electricity in extracting, pumping and pre-treatment the landfill gas should be accounted as project emissions and included in the emission reduction calculations respectively. It was corrected in version 01 of the PDD. But we need more clarification. This is confirmed on additional documents provided by participant and it was corrected in version 02 of the PDD	CI8	OK
B.3.2. Have all relevant greenhouse gases and	PDD /B.6.	DR	Refer to B.3.1	OK	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
sources been evaluated?	3				
B.3.3. Do the methodologies for calculating project emissions comply with existing good practice?	PDD /B.6. 3	DR	The calculation of the emission reduction is in accordance with AMS-I,D, AMS-III.G and take into account all relevant factors of the project technology	OK	OK
B.3.4. Are the calculations documented in a complete and transparent manner?	PDD /B.6.	DR/I	Blower, starting power plant are emission from on-site electricity use sources (self consumption ratio: 3%) which is provided by project participant. But the project participant should provide information for imported electricity additionally and must address in PDD. This confirmed on additional documents provided by participant and it was corrected in version 02 of the PDD	CI20	OK
B.3.5. Have conservative assumptions been used?	PDD /B.6.	DR/I	Refer to B.3.4	OK	OK
B.3.6. Are uncertainties in the project emissions estimates properly addressed?	PDD /B.6.	DR/I	This is not described in the PDD. It needs to be clarified. This was clarified on additional documents provided by participants	CI21	OK
B.4. Calculation of GHG emission - Baseline GHG Emissions The validation of predicted baseline GHG emissions focuses on transparency and completeness of calculations.					
B.4.1. Are the baseline emission boundaries clearly defined and do they sufficiently cover sources for baseline emissions?	PDD /A.2. 1,A.	DR	For the treatment of the LFG the boundaries are defined as the physical, geographical site where the project takes place	OK	OK

* MoV = Means of Verification, DR= Document Review, I= Interview

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
	2.2, B.3				
B.4.2. Are all aspects related to direct and indirect baseline emissions captured in the project design?	PDD /B.3	DR/I	<p>Energy source for pre-treatment system and power generation system is not clear, thereby requiring clarification.</p> <p>It has been confirmed that the energy source of pre-treatment system such as Blower is electricity through onsite visit, and that it has been considered in the self-consumption ratio (3%).</p> <p>However, additional clarification of the data is required for basis for computation of self-consumption ratio of 3% in order to compute the net quantity of electricity generation.(Related to B.3.1)</p> <p>This was confirmed on additional documents(benchmarking data) provided by participant</p>	CI8	OK
B.4.3. Have all relevant greenhouse gases and sources been evaluated?	PDD /B.3	DR	Yes	OK	OK
B.4.4. Do the methodologies for calculating baseline emissions comply with existing good practice?	PDD /B.6.	DR	The calculation of the emission reduction is in accordance with AMS-I,D, AMS-III.G and take into account all relevant factors of the project technology	OK	OK
B.4.5. Are the calculations documented in a complete and transparent manner?	PDD /B.6, Annex3	DR/I	<p>The project participant should provide more evidence for F, $W_{j,x}$ and need clarification for K_j, EF_{OM}, EF_{BM}, Operation and management cost, Existing waste amount.</p> <p>EF_{OM}, EF_{CM}, $BE_{v,electricity}$, DOC should be corrected</p>	CAR4	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			in the PDD. This confirmed on additional documents provided by participant and it was corrected in version 02 of the PDD		
B.4.6. Have conservative assumptions been used?	PDD /B.6	DR	Refer to B.4.5	OK	OK
B.4.7. Are uncertainties in the baseline emissions estimates properly addressed?	PDD /B.6	DR	Refer to B.4.5	OK	OK
B.4.8. All the assumptions and data used by the project participants are listed in the PDD, including their references and sources	PDD /B	DR	All of assumptions and data were not addressed in PDD. It was corrected in version 01 of the PDD	CAR5	OK
B.5. Leakage It is assessed whether there leakage effects, i.e. change of emissions which occurs outside the project boundary and which are measurable and attributable to the project, have been properly assessed.					
B.5.1. Are leakage calculation required for the selected project category and if yes, are the relevant leakage effects assessed?	PDD /B.6	DR	No leakage calculation is required for this project	OK	OK
B.5.2. Are potential leakage effects properly accounted for in the calculations (if applicable)?	PDD /B.6	DR	Refer to B.5.1	OK	OK
B.5.3. Do the methodologies for calculating leakage comply with existing good practice (if applicable)?	PDD /B.6	DR	Refer to B.5.1	OK	OK
B.5.4. Are the calculations documented in a complete and transparent manner and (if	PDD /B.6	DR	Refer to B.5.1	OK	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
applicable)?					
B.5.5. Have conservative assumptions been used (if applicable)?	PDD /B.6	DR	Refer to B.5.1	OK	OK
B.5.6. Are uncertainties in the leakage estimates properly addressed (if applicable)?	PDD /B.6	DR	Refer to B.5.1	OK	OK
B.6. Emission Reductions Validation of baseline GHG emissions will focus on methodology transparency and completeness in emission estimations.					
B.6.1. Will the project result in fewer GHG emissions than the baseline case?	PDD /A.4. 3	DR	Yes, The project is forecasted to reduce CO ₂ emissions to the extent of 257,949 tCO ₂ e (25,795 tCO ₂ e/year average) over the defined fix 10-year crediting period	OK	OK
B.7. Monitoring Plan The monitoring plan review aims to establish whether all relevant project aspects deemed necessary to monitor and report reliable emission reductions are properly addressed. - Monitoring Methodology It is assessed whether the project applies an appropriate monitoring methodology.					
B.7.1. Is the selected monitoring methodology in line with the monitoring methodologies provided for the relevant project category?	PDD /B.7	DR	The project applies the approved monitoring methodology, - AMS I. D (Grid connected renewable electricity generation_V13), AMS III. G(Landfill methane recovery_V6) are applied But the monitoring methodology were not addressed in the PDD/B.7	CI7	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			It was addressed in version 02 of the PDD.		
B.7.2. Is the monitoring methodology applicable to the project being considered?	PDD /B.7	DR	But the applicability of monitoring methodology were not addressed in the PDD It was addressed in version 02 of the PDD.	CI7	OK
B.7.3. Is the application of the monitoring methodology transparent?	PDD /B.7	DR	Refer to B.7.2	OK	OK
B.7.4. Will the monitoring methodology give opportunity for real measurements of achieved emission reductions?	PDD /B.7	DR	Refer to B.7.2	OK	OK
B.8. Monitoring of Project Emissions It is established whether the monitoring plan provides for reliable and complete project emission data over time.					
B.8.1. Are the choices of project emission indicators reasonable?	PDD /B.6. 3	DR/I	EL _{IMP.PJT.y} was presented as monitoring indicator and it is determined that PE would be present. However, it is indicated as 0 on the PDD. It was confirmed that there is no separate project emission other than those from the pre-treatment system and at the time of power starting through correctional PDD and separate data provided by the participant, and onsite visit, and that it is measured continuously through measurement apparatus. It is possible to monitor the power transparently through power integration apparatus of KEPCO and the choice of indicators is reasonable.	CI24	OK
B.8.2. Will it be possible to monitor / measure the	PDD /B.6.	DR/I	Refer to B.8.1	OK	OK

* MoV = Means of Verification, DR= Document Review, I= Interview

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
specified project emission indicators?	3				
B.8.3. Do the measuring technique and frequency comply with good monitoring practices?	PDD /B.6. 3	DR/I	Refer to B.8.1	OK	OK
B.8.4. Are the provisions made for archiving project emission data sufficient to enable later verification?	PDD /B.6. 3	DR/I	Refer to B.8.1	OK	OK
B.9. Monitoring of Leakage It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.					
B.9.1. If applicable, are the choices of leakage indicators reasonable?	PDD /B.6. 3	DR	Leakage is not applicable according to AMS-I.D and AMS.III.G	OK	OK
B.9.2. If applicable, will it be possible to monitor / measure the specified leakage indicators?	PDD /B.6. 3	DR	Refer to B.9.1	OK	OK
B.9.3. If applicable, do the measuring technique and frequency comply with good monitoring practices?	PDD /B.6. 3	DR	Refer to B.9.1	OK	OK
B.9.4. If applicable, are the provisions made for archiving leakage data sufficient to enable later verification?	PDD /B.6. 3	DR	Refer to B.9.1	OK	OK
B.10. Monitoring of Baseline Emissions It is established whether the monitoring plan provides for reliable and complete project emission data over time.					
B.10.1. Does the monitoring plan provide for	PDD	DR/I	There are no details on specification data, error	CAR3	OK

* MoV = Means of Verification, DR= Document Review, I= Interview

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/B.7. 1		<p>rate, calibration procedure for LFG_{electricity,y}, W_{CH₄,y}, T, P, EL_{EXP,PJT,y}, EL_{IMP,PJT,y}, thereby requiring additional information.</p> <p>Although information on flow meter through corrected PDD was added, details for gas analyser has not been added as the apparatus has yet to be chosen.</p> <p>This was confirmed on additional documents provided by participant related to gas analyser and it was added in version 02 of the PDD</p>		
B.10.2. Is the choice of baseline indicators, in particular for baseline emissions, reasonable?	PDD /B.7	DR	CH ₄ is the only baseline indicator that needs to be taken into account	OK	OK
B.10.3. Will it be possible to monitor / measure the specified baseline emission indicators?	PDD /B.7	DR	Refer to B.10.1	OK	OK
B.10.4. Do the measuring technique and frequency comply with good monitoring practices?	PDD /B.7	DR	<p>Flow meter, which is highly efficient apparatus with twice the cost of those distributed in Korea at the moment, has been applied, making it the most appropriate apparatus among all those used in landfills</p> <p>But we need more clarification for gas analyzer. Related to B.10.1</p> <p>This confirmed on additional documents provided by participant related to gas analyser and it was added in version 02 of the PDD</p>	CI25	OK
B.10.5. Are the provisions made for archiving baseline emission data sufficient to enable later verification?	PDD /B.7	DR	Refer to B.10.1	OK	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.11. Project Management Planning It is checked that project implementation is properly prepared for and that critical arrangements are addressed.					
B.11.1. Is the authority and responsibility of project management clearly described?	PDD /B.7. 2	DR/I	Although the PDD had mentioned a team assigned to monitor emission reductions, The project participant should provide more evidence for position of team It was corrected in version 01 of the PDD.	CI9	OK
B.11.2. Is the authority and responsibility for registration monitoring measurement and reporting clearly described?	PDD /B.7. 2	DR/I	Authority and responsibility in <Figure B-3> and <Table B-18> are not same. It was corrected in version 01 of the PDD and confirmed on onsite visit.	CI10	OK
B.11.3. Are procedures identified for training of monitoring personnel?	PDD /B.7. 2	DR/I	No identified procedures for training of monitoring personnel. It was corrected in version 01 of the PDD and confirmed on onsite visit..	CI11	OK
B.11.4. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	PDD /B.7. 2	DR/I	Actually there is a emergency procedure of the landfill but without CDM project No emergency procedures in case of unintended emissions of LFG were evidenced It was corrected in version 01 of the PDD and confirmed on onsite visit	CI12	OK
B.11.5. Are procedures identified for calibration of monitoring equipment?	PDD /B.7. 2	DR/I	Calibration procedures was not provided in PDD related to flow meter, gas analyzer, It was addressed in version 02 of the PDD	CI13	OK
B.11.6. Are procedures identified for	PDD	DR/I	No maintenance of monitoring equipment and	CI14	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
maintenance of monitoring equipment and installations?	/B.7.2		installations procedures provided in PDD It was not addressed for flow meter in version 01 of the PDD and the project participant should provide information for gas analyzer. This confirmed on additional documents provided by participant related to manuals and it was added in version 02 of the PDD		
B.11.7. Are procedures identified for monitoring, measurements and reporting?	PDD /B.7.2	DR/I	It was confirmed the data of quantity of electricity exported/imported can be checked by invoices. However, no reporting procedures provided in PDD It was corrected in version 01 of the PDD and confirmed on onsite visit	CI15	OK
B.11.8. Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	PDD /B.7.2	DR/I	Refer to B.10.1 (The data will be collected continuously and archived in electronic form, during the whole crediting period plus 2 years. The project participant should address data collection cycle and recording form of LFG _{electricity,y} , W _{CH4,y} , T, P).	OK	OK
B.11.9. Are procedures identified for dealing with possible monitoring data adjustments and uncertainties?	PDD /B.7.2	DR/I	Procedures were not provided. This confirmed on additional documents provided by participant.	CI16	OK
B.11.10. Are procedures identified for internal audits of GHG project compliance with operational requirements as applicable?	PDD /B.7.2	DR/I	No procedures provided It was corrected in version 01 of the PDD and confirmed on onsite visit.	CI17	OK
B.11.11. Are procedures identified for project performance reviews?	PDD /B.7.2	DR	No procedures provided It was corrected in version 01 of the PDD and confirmed on onsite visit.	CI18	OK

* MoV = Means of Verification, DR= Document Review, I= Interview

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.11.12. Are procedures identified for corrective actions?	PDD /B.7.2	DR	No procedures provided It was corrected in version 01 of the PDD and confirmed on onsite visit.	CI19	OK
C. Duration of the Project / Crediting Period It is assessed whether the temporary boundaries of the project are clearly defined.					
C.1.1. Are the project's starting date and operational lifetime clearly defined?	PDD /A.2, C.1.1	DR/I	Project's starting date is defined 01 April, 2008. But according to the definition in the glossary of terms, starting date is must the date of contract. But it in not clear between the date of contract with Mokpo city and project's starting date, The project participant should provide more data for project's starting date. And it in not same between the construction date in contract with Mokpo city (10 April, 2008-31 March 2009) and project's starting date in PDD (01 April, 2008). It was corrected in version 01 of the PDD. The operational lifetime of the project activity is approximately 15 years. This confirmed by power generator's operational manual and technical provider's interview	CAR6	OK
C.1.2. Is the crediting period clearly defined (seven years with two possible renewals or 10 years with no renewal)?	PDD /C.2	DR	A fixed 10 year crediting period is selected, starting on 01 January, 2009. But this seems not possible and will be modified. It was corrected in version 01 of the PDD. In the PDD version 3, considering a point of time for expected acceptance of LoA from DNA, starting	CI6	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			date of crediting period is revised by participant, on the date of registration. This is confirmed.		
D. Environmental Impacts It is assessed whether environmental impacts of the project are sufficiently addressed.					
D.1.1. Does host country legislation require an analysis of the environmental impacts of the project activity?	PDD /D.1	DR/I	Document from EIA law indicate that EIA is not required for the project	OK	OK
D.1.2. Does the project comply with environmental legislation in the host country?	PDD /D.1	DR	<p>Yes. It is confirmed on a written approval letter (LoA) from the DNA of Republic of Korea.</p> <p>With regards to follow-up of the project, according to the atmospheric environmental preservation law of the Ministry of Environment, standard of allowable emission of NO₂ (125ppm) has to be complied with. Accordingly, documents illustrating such compliance and future measures against adherence of the said regulation are necessary. Project participants must update their regularization plan. This need to be confirmed during verification</p>	CAR1 FAR1	OK OK
D.1.3. Will the project create any adverse environmental effects?	PDD /D.2	DR/I	No adverse environmental effects identified	OK	OK
D.1.4. Have environmental impacts been identified and addressed in the PDD?	PDD /D.2	DR	<p>Project participant complete self environmental impact assessment. And no significant environmental impacts identified yet.</p> <p>But we need more clarification for this.</p> <p>This is confirmed on additional documents which are provided by participant and corrected in version</p>	CI22	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			01 of the PDD.		
E. Comments by Local Stakeholder Validation of the local stakeholder consultation process.					
E.1.1. Have relevant stakeholders been consulted?	PDD /E.1	DR/I	Announcement have opened in local newsletter, Mokpo Metropolitan City stakeholder's website and stakeholders meeting have opened with 42 participants and stakeholders in November 2006. But the project participant should provide more evidence for meeting time, pictures and recording. It was corrected in version 01 of the PDD.	CI23	OK
E.1.2. Have appropriate media been used to invite comments by local stakeholders?	PDD /E.1	DR	Refer to E.1.1	OK	OK
E.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	PDD /E.1	DR	Stakeholders consultation process for the project is not required by the legal regulations in Republic of Korea	OK	OK
E.1.4. Is a summary of the comments received provided?	PDD /E.2	DR	Project participant should provide detailed documents for result of meeting. It was corrected in version 01 of the PDD.	CI23	OK
E.1.5. Has due account been taken of any comments received?	PDD /E.2	DR	No actions were necessary in order to take due account of comments received	OK	OK

Table 3 Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>CAR.1</p> <p>A written approval letter(LoA) from the DNA of Republic of Korea needs to be obtained</p>	A.3.4		<p>Receipt of a written approval letter(LoA) from the DNA of Republic of Korea was confirmed.</p> <p>Therefore CAR1 is closed.</p>
<p>CAR.2</p> <p>PDD v.0; 2008.12.9)</p> <p>1) For Regulation</p> <p>Although this project has venting system with regards to processing of gas, captured LFG is released to atmosphere.</p> <p>Accordingly to Waste Control Act of Republic of Korea, landfills in Korea must be equipped with gas combustion facility or generation/fuel production processing facility (Article 709 of Implementation Act on Law for Management of Waste), and installation of horizontal and vertical gas elimination pipe is stipulates to make collection of gas easy in considerations for prevention of risk of explosion (Attached table 11 K).</p> <p>That is, although the atmospheric emission,</p>	B.2.1,3	<p>PDD v.0; 2008.12.9)</p> <p>1) For Regulation</p> <p>In the case of Mokpo City, venting system has been installed and operated in order to comply with the law, and flaring was attempted but it resulted in fire.</p> <p>That is big problem because of Mokpo landfill site are surrounded mountain. And flaring can cause a forest fire.</p> <p>Therefore, the Mokpo city is allowing emission into the atmosphere due to safety issue.</p> <p>This treatment format has been recognized in the Treatment Facility Approval of Jeollanamdo and in regular</p>	<p>1) For Regulation</p> <p>Although there is Waste Control Act of Republic of Korea, rights to management and ownership of landfill are with the Local government. Pursuit of project is impossible due to insufficient economic feasibility of power generation/resources production. The fact that there was approval of the local government that atmospheric emission is allowed due to too much risk of wild fire since the surrounding areas of the landfill sites are mountainous regions was confirmed through the Letter of Approval for the Treatment Facilities issued by Jeollanamdo to Mokpo City, and cross checked through the regular examination report (2008.1) on landfill facilities carried out by the Korea Rural</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>which is that alternative 1 and baseline in PDD/B.4 complies with portion of the Waste Control Act of Republic of Korea (venting system), it is not complying with the law that the facility must incinerate or be equipped with generation / resource production.</p> <p>Therefore, it is difficult to consider that the atmospheric emission described in PDD/B.4 (passive venting the LFG) fully complies with the processing facility stipulated by the Waste Control Act of Republic of Korea, and the explanation that the current situation fully complies with the law is inappropriate, thereby requiring amendment.</p> <p>In addition, although PDD/B.4 specified that LFG management is not an enforceable issue under the Waste Control Act of Republic of Korea, it does not specify the basis of such interpretation. Therefore, as it is difficult to determine on what basis this is not an enforceable issue, additional data on this is required.</p> <p>In addition, additional clarification is required to find out whether there is regulation related to processing of landfill gas under the local governmental law of Mokpo City.</p>		<p>examination of National Landfills, and, therefore, can be said to comply with the existing law.</p> <p>Although there is regulation on landfill in the local governmental law of Mokpo City, there is no regulation on LFG treatment.</p> <p>Additional data will be submitted and contents in PDD regarding this issue will be amended.</p>	<p>Corporation (Public auditor).</p> <p>Through the interview with the personnel in charge of regular examination report, it was acknowledged that treatment facility is being possessed (waste management law) on when venting system is possessed without gas incineration, power generation or resources production facility. So, "Waste Control Act" has more the character of a policy. Accordingly, EMC, with regards to the additionality, acknowledge that assertion of the participant that the Waste Control Act of Korea is not systematically enforceable.</p> <p>There are no separate regulations under the local governmental law of Mokpo City in relations to this, and this was cross checked through legal documents and interview with civil servant in charge.</p> <p>Similar cases with above include landfill CDM projects in Mexico, and EMC has interpreted that these cases are similar to those in Korea.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>With relations to the power supply, the project is to be connected to the grid</p> <p>2) For Technical barriers PDD/B.4 alternative 2, by mentioning that there is Investment and technological barriers, explained that detailed description is given in the PDD/B.5. However, there is no description on technical barriers in PDD/B.5, thereby requiring additional data.</p> <p>3) For Investment barriers Unit cost of electricity purchase (65.25d Won/kWh) is the figure for 2004-2006, and in considerations for the commencement date of the project, it needs to be provided more with the latest data for 2007. In addition, additional submission of outcome of application of the unit cost of electricity purchase for 2008 is required additionally.</p> <p>4) For common practice analysis Contents presented are different from the Waste Control Act of Republic of Korea, and a few landfills that generate power or</p>		<p>2) For Technical barriers It was corrected in version 01 of the PDD.</p> <p>3) For Investment barriers It was corrected in version 01 of the PDD.</p> <p>4) For common practice analysis It was corrected in version 01 of the PDD.</p>	<p>2) For Technical barriers It is determined that deletion of the contents is not unreasonable.</p> <p>3) For Investment barriers When the unit cost of electricity purchase for 2007 is applied, it is still non-profitable if without CDM, and it was also verified that application of unit cost of electricity purchase for 2008 also makes it non-profitable in itself as well.</p> <p>4) For common practice analysis In the case of small scale CDM, details in this category are not obligatory, therefore, deletion of the main text of PDD is acknowledged.</p> <p>So CAR2 is closed</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>produces resources are all large capacity that is similar to that of this product (existence of similar projects). Although PDD states that majority of landfill that produces power and resources are being pursued with considerations for CDM and that if CERs are not considered, it would not be financially attractive, according to the in-house search of EMC, it was confirmed that CDM at the Daejun and Busan Landfill was stopped recently (pre consideration problem), and the situations in Andong and Yeosu are also similar. Interpretation of such is that although the power generation project for the landfill in Korea is determined to be profitable project in itself, and private sectors invested in the projects with the anticipation that power generation at landfill would be economical through verification through technical expert interview and report, profitability on its own is not sufficient due to error in presumption of quantity of gas generated from landfill and increase in operational expenditures. In summary, the basis of PDD that stated that power generation at other landfills in Korea commenced from the beginning with considerations for CDM is not valid and thereby requiring additional data for such statement.</p>			

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>PDD v.1; 2009.1.17)</p> <p>1) For Regulation</p> <p>We need clarification using interview with local authorities.</p>			

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>CAR.3 PDD v.0; 2008.12.9)</p> <p>LFG_{electricity,y}</p> <ul style="list-style-type: none"> - No specification of flow meter (including model number) - No error rate - No monitoring frequency - No procedures of emergency(ex. corrosion) - No procedures of calibration - No data recording form(electric or hard copy) <p>W_{CH4,y}</p> <ul style="list-style-type: none"> - No specification of gas analyzer (including model number) - No error rate - No monitoring frequency - No procedures of emergency(ex. corrosion) - No procedures of calibration - No data recording form(electric or hard copy) 	<p>B.10.1 B.10.3-5</p>	<p>PDD v.0; 2008.12.9)</p> <p>Details on the Flow meter and gas analyser were left out as apparatus has not been selected nor installed. As selection of flow meter apparatus has been completed, additional contents will be provided.</p> <p>T, P: Selected Flow meter automatically computes T, P. in real-time, there is no need for separate measurement. Details of this were added.</p>	<p>All of the corrective actions were completed.</p> <p>So CAR3 is closed</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>T, P</p> <ul style="list-style-type: none"> - No specification of gas analyzer (including model number) - No error rate - No monitoring frequency - No procedures of emergency(ex. corrosion) - No procedures of calibration - No data recording form(electric or hard copy) <p>EL_{EXP,PJT,y}</p> <ul style="list-style-type: none"> - No error rate - No monitoring frequency - No procedures of emergency(ex. corrosion) - No procedures of calibration - No data recording form(electric or hard copy) <p>EL_{IMP,PJT,y}</p> <ul style="list-style-type: none"> - No error rate 			

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<ul style="list-style-type: none"> - No monitoring frequency - No procedures of emergency(ex. corrosion) - No procedures of calibration - No data recording form(electric or hard copy) <p>PDD v.1; 2009.1.17)</p> <p>We need more clarification for gas analyzer</p>		<p>PDD v.1; 2009.1.17)</p> <p>Selection of apparatus for Gas analyser is yet to be made.</p> <p>PDD v.2; 2009.2.2)</p> <p>Details on the gas analyser were provided</p>	

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>CAR.4 PDD v.0; 2008.12.9)</p> <p>DOC_j</p> <ul style="list-style-type: none"> - There is not basis that illustrates that wet waste value between the values for wet waste and dry waste does not exist. <p>F</p> <ul style="list-style-type: none"> - Was used but presented AMS III G. ver4 as the basis document. Adjustment to the latest version (ver6) is required. In addition, there is no basis for the statement that “there is no regulation on enforcement of LFG capture in the host country”. <p>K_j</p> <ul style="list-style-type: none"> - Although the atmospheric data was said to be Korea Meteorological Association, there is no such authorized institution in Korea under this name. Rather, Korea Meteorological Administration is the authorized institution for atmospheric statistics of Korea. Additional confirmation 	<p>B.4.5</p>	<p>PDD v.0; 2008.12.9)</p> <p>DOC_j</p> <ul style="list-style-type: none"> - Used high values for conservative application. <p>F</p> <ul style="list-style-type: none"> - It was corrected in version 01 of the PDD. - “No regulation enforce LFG capture in the host country” was eliminated. <p>K_j</p> <ul style="list-style-type: none"> - Korea Meteorological Administration is correct name. - It was corrected in version 01 of the PDD. 	<p>All of the corrective actions were completed. So CAR4 is Closed</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>on this is needed.</p> <ul style="list-style-type: none"> - Although the data used must be long term average based on statistics, there is no indication on the number of years the values given in PDD have been measured - Presented value was confirmed as the 30-year average through verification with Korea Meteorological Administration, it must be additionally stated that it is average value over 30 years. <p>$W_{j,x}$</p> <ul style="list-style-type: none"> - In the landfill statistics of the Ministry of Environment, the xls sheet refers the others among the combustables as textile and set that there are not garden and park wastes. Confirmation of this is necessary. - According to the Xls sheet, for the formation prior to 2005, the average value for the period 2002~2004 (3 years) has been applied equally since 1995. But, there is annual formation data since 1996 for the composition data on the landfill that the participant provided exists. Therefore, there is need to verify the basis for uniformly applying the average over the last 3 years even though there is annual 		<p>$W_{j,x}$</p> <ul style="list-style-type: none"> - It is the result due to difference between overseas categorization criteria and domestic analysis standard. Textile with low quality of landfill gas generation was chosen for conservative computation. - Will be corrected to computational equation that utilizes annual formation data - There is data from 2006 and will be submitted additionally. 	

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>formation data.</p> <ul style="list-style-type: none"> - Although the formation since 2005 was based on application of the average value for the period 2005-2006, there is no data for 2006 among the landfill composition data provided by the Participant, therefore, additional confirmation is needed - Utilization of the data under Any comment is unclear <p>EF_{OM}</p> <ul style="list-style-type: none"> - Although PDD states that IPCC 1996 was used for the EF value for each Fuel type in the Xls sheet (tCO₂/TJ), verification indicates that it is different. - Although the value 0.95 applied in deducting the net caloric value in the Xls sheet indicates that the values of Coal, Oil = 0.95, and LNG=0.9, its source has not been indicated, thereby requiring verification (If it is OXID, then the values are different) - Yonghung #3, #4 among the Bituminous coal within the OMEF 2007 xls sheet is not present in the 2008 Facility by Electric 		<p>EF_{OM}</p> <ul style="list-style-type: none"> - We used EF in IPCC2006. It was corrected in version 01 of the PDD. - IPCC2006 is the source of net caloric value. - Results caused by partial difference between the contents in the front and back section of KPX report. Everything aligns when the contents in the back section is followed. - With regards to PDD/Annex3 p38-40, the contents of ACM0002/Version06 were corrected to the latest 	

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>power source, KPX p192. Source needs to be verified</p> <ul style="list-style-type: none"> - Namjeju #1, #2 and Youngnam \$1, #2 among the Heavy oil, and Bundang among LNG in the OMEF 2007 xls sheet is not present in 2008 Facility by Electric power source, KPX p192. Source needs to be verified - Composite fire power (LNG) provided in the 2008 Facility by Electric power source, KPX, p196-199 and that in the OMEF 2005,2006 xls sheet are different, thereby needing to verify the reason for such difference - Verify the reasons for selecting only Namjeju and Jeju in the Internal combustion (in the 2008 Facility by Electric power source, KPX, p200-203, numerous plants are presented for each fuel) - Although it has been confirmed as the statistical value of KPX (2007) because the source of EG m,y (Electricity generation; MWh) data has not been specified, the xls sheet includes decimal points. Therefore, need additional verification on the source of data. 		<p>methodology (Tool to calculate the emission factor for an electricity system, version 01.1).</p> <ul style="list-style-type: none"> - EF_{OM} was verified and accordingly corrected. - Separate report was submitted for means of and results of securing formation data. 	

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<ul style="list-style-type: none"> - Although it is specified that 5-year average data is 41.49%. So Option(a) has been selected in PDD, basis for the data has not been specified, thereby needing verification (which data of KEPCO?) - Reasons for selecting OptionA(EB35) has not been specified, thereby needing verification (interpretation on data available) - PDD/Annex3 p38-40 does follow the methodology of ACM0002/Version06 (Tool to calculate the emission factor for an electricity system, version 01.1). Need to change to the latest version (Version09). In addition, EF_{OM} is being presented as 0.6817, which needs to be corrected to 0.6769 - What is the method of securing formation Data? Items such as sampling frequency must be specified in the tool <p>EF_{BM}</p> <ul style="list-style-type: none"> - Source of 46. Hyundaedaesan data for year 2007 in the XIs sheet is not clear - According to 2008 Facility by Electric power source, KPX p45, the 		<p>EF_{BM}</p> <ul style="list-style-type: none"> - Results caused by partial difference between the contents in the front and back section of KPX report. Everything aligns when the contents in the back section is 	

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>commencement date of operation for Hankyung Windpower #2 is Dec, 2007, it is missing in the xls sheet. There is need to verify the reasons for omitting it from computation.</p> <ul style="list-style-type: none"> - According to Xls sheet, the commencement date for operation of Nonhyun heat & power is 2007.10, but according to 2008 Facility by Electric power source, KPX p43, it is January 2007, thereby needing to verify which is error. - Mirae energy(2007.02) included in Xls sheet is not present in 2008 Facility by Electric power source, KPX p46. The source is unclear. - Yeongju the second solar(2007.01) included in Xls sheet is not present in 2008 Facility by Electric power source, KPX p46. Source is unclear - Linking of value of Net electricity generated in Xls cannot be verified - Source of data for Total electricity supplied to the grid in 2007 is unclear - There is need to verify the reasons for not having computed EF on plants that uses fuels such as LFG including Combined, 		followed.	

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>pumping, WunjeongLFG (internal combustion; 2005.7) in the Xls sheet</p> <ul style="list-style-type: none"> - There is need to verify the reasons for not having computed EF of 27,28, 29, 32 internal combustion including Cheongju LFG(2004.2) <p>EF_{BM}</p> <ul style="list-style-type: none"> - PDD specified 0.5375 while it is 0.5351 in xls sheet, needing correction <p>Operation and management cost</p> <ul style="list-style-type: none"> - Obtained data from EMC' team, the average O&M costs of USA 3MW cases are 13.2-16.4% of construction cost (U.S. EPA Landfill Methane outreach program, Landfill gas energy cost model, LFGcost, Version1.4 summary report Appendix 4-A Electricity case studies, 15 Dec 2008 and Table4-1 of LFG energy project development handbook , EPA). So the O&M costs of this project are little bit higher (19%) than above documents. Considering of "Economies of scale", O&M Costs of this project (2MW) are reasonable, But we need more 		<p>EF_{BM}</p> <ul style="list-style-type: none"> - It was corrected in version 01 of the PDD. <p>Operation and management cost</p> <ul style="list-style-type: none"> - Basis documents were submitted additionally. - Cost of monitoring and verification was reflected in version 01 of the PDD. 	

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>clarification and cross check about this.</p> <ul style="list-style-type: none"> - Although cost of monitoring and verification is generated in the CDM project working costs, it is set at '0'. Therefore, correction is needed. <p>CERs price</p> <ul style="list-style-type: none"> - Although the XIs sheet presumed it is same price as the EUAs (15 Euros), thereby needing correction when considering that the general CERs price is lower than EUAs. However, it is acknowledged since it is within the range of changes in price. <p>Self consumption ratio</p> <ul style="list-style-type: none"> - Although it has been specified that the "actual data since the starting operation during the period from March 2005 to July 2007" when setting it to 3% in the XIs sheet, the commencement date of commercial operation of the project is specified differently as September 2008 in the PDD, thereby needing verification 		<p>Self consumption ratio</p> <ul style="list-style-type: none"> - It was mistyping and was deleted. 	

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>BE_{y,electricity}</p> <ul style="list-style-type: none"> - Although CEF 0.5351 was used in CEF but it is specified as 0.5375 in PDD, thereby needing correction. <p>DOC</p> <ul style="list-style-type: none"> - Error of using W value of 'before 2005' until 2002 and using W value of 'after 2005' since 2003 was found in the Xls sheet, the CERs value in PDD results in erroneous result value - There is need to correct the data to using W value of 'before 2005' until 2004 and using W value of 'after 2005' since 2005. <p>Existing waste amount</p> <ul style="list-style-type: none"> - For the period 1996~2006, format of daily average quantity of landfill * 365 days was used, which is different from the statistical data provided by the Ministry of Environment and the source of data on daily quantity of landfill is unclear, thereby needing additional verification. - 1995 was set same as 1996, and needs to verify the reason for this. 		<p>BE_{y,electricity}</p> <ul style="list-style-type: none"> - It was corrected in version 01 of the PDD. <p>DOC</p> <ul style="list-style-type: none"> - It was corrected in version 01 of the PDD. <p>Existing waste amount</p> <ul style="list-style-type: none"> - Data provided by the Ministry of Environment. Additional data will be provided. - 1995 was deleted. - The latest data was used in analysis in considerations for the accuracy of the data. - Trend analysis model was reviewed. 	

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<ul style="list-style-type: none"> - Quantity of landfill since 2007 was based on the data for 2002~2005, there is need to verify whether it is a significant application of value that considers statistical generalization. - Need to confirm the reasons for applying - 0.42% + -0.32% <p>PDD v.1; 2009.1.17) Existing waste amount Reasons for having applying -0.42% + - 0.32% have not been specified, thereby needing additional confirmation.</p>		<p>PDD v.1; 2009.1.17) Data was submitted.</p> <p>PDD v.2; 2009.2.2) Data was submitted.</p>	

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CAR.5 PDD v.0; 2008.12.9) Needs to supplement as there are much assumptions and data not specified in the PDD	B.4.8	PDD v.0; 2008.12.9) It was corrected in version 01 of the PDD.	CAR5 is closed as addition of assumptions and data has been completed
CAR.6 PDD v.0; 2008.12.9) Project's starting date is defined April 1, 2008, but according to the definition in the glossary of terms, starting date must be the date of execution of the contract. Duration of the construction under the agreement for change that the Participants provided specifies that "from 2007.4.10, which is the date of execution of the agreement, to 2009.3.31". However, although the starting date of collection system construction in PDD A.2 is April 2008, and 2008. 4. 1 in PDD C.1.1, the date of execution of agreement for changes is 2008. 11. 17, thereby needing the reasons why the date of execution of the contract is later than the commencement date of the construction. As 2008.4.1 is the commencement date of	C.1.1	PDD v.0; 2008.12.9) Although the original contract was executed between Sejin ENG and Ecoeye, and Mokpo City in April 2007, and the project proceeded, securing of investment failed and Ecoeye forfeited the project. In 2008, Sejin ENG (Technical provider) and Hanwha Corporation entered into agreement for changes with Mokpo City, and the project was recommenced. <ul style="list-style-type: none"> - All the contract documents related to above will be submitted. The Project's starting date is indeed April 10, 2008. It was corrected in version 01 of the PDD. - It was corrected in version 01 of the PDD. 	Corrected PDD, It was confirmed through data and contract received from the participant. The operational lifetime of the project activity is approximately 15 years. This confirmed by power generator's operational manual and technical provider interview So CAR6 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>construction, not the date of execution of the contract, it cannot be the starting date of project.</p> <p>Date of execution of contract and commencement of construction is the date of execution of the contract (April 10, 2008) and the project start date in C.1.1 is deemed to be April 10, 2008, thereby needing correction of PDD/C.1.1.</p>			

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>CAR.7 PDD v.0; 2008.12.9)</p> <p>The goal of a LFG energy project is to convert LFG into a useful energy form, such as electricity, steam, vehicle fuel, or pipeline quality gas (LFG energy project development handbook, EPA)</p> <p>In Korea, four type of alternatives are used (during total 252of active landfill site, 226 of venting without gas treatment, 11 of gas flaring, 14 of electricity generation, 1 of gas reuse). So PDD must include 2 more alternatives.</p>	B.2.6	<p>PDD v.0; 2008.12.9)</p> <ul style="list-style-type: none"> - It was corrected in version 01 of the PDD. 	<p>It has been added through PDD supplementation.</p> <p>So CAR7 is closed.</p>
<p>CAR.8</p> <p>According to CDM-Glos-04, although this project is an existing project activity, base material on prior consideration is absent, thereby requiring verification of documents such as Decision documents by the Board of Directors.</p> <p>PDD v.0; 2008.12.9)</p> <p>Additional data on the considerations made at the initial stage of the project needs to be submitted.</p>	B.2.7	<p>PDD v.0; 2008.12.9)</p> <p>The project, following hearing for the residents in November 2006, public announcement (public announce</p>	<p>Execution of cross check was completed through contract documents between the stakeholders (including Sejin ENG vs Ecoeye vs Mokpo at 2007.4.10), Decision documents by the Board of Directors of Hanhwa corporation, and Decision documents by the Directors Mokpo city. CERs revenue is accurately indicated in the economic feasibility analysis data specified in the feasibility study report that Hanhwa corporation submitted to Board of Directors for the project in</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		<p>number: 2007-1; www.mokpo.go.kr/home) in accordance with the decision-making of the Mayor of Mokpo City was made on January 8, with the public announcement specifying that the project must include CDM project. That is, unlike other landfill electricity generation project that has already been pursued in Korea, there is publicly opened document that it has been pursued with CDM as the purpose. Although investment was to be made with Sejin ENG (Technical provider) and Ecoeye (CDM developer & Investor), as a consortium won the tender, with 100% of the CER profit to be given to Ecoeye, as per the public announcement made on April 10, 2007, Ecoeye gave up on the project due to failure to secure fund because of project risks and the project was on the verge of dissipation. However, Hanhwa Corporation (CDM developer & Investor), the current project participant, decided to pursue the project in April 2008, and executed the project by entering into contract with Sejin ENG and Mokpo City.</p>	<p>February 2008, it also explains that project will not be profitable without CDM.</p> <p>That is, cross check was verified through the additional data provided by the Participant and secured by EMC.</p> <p>However, this category is also included in the deliberation categories of the Korea DNA. Therefore, it is confirmed through reception of Letter of approval, finally CAR8 is closed.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		All relevant evidence and decision documents by the Board of Directors were requested for submission.	

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>CL.1</p> <p>Yes. The project boundary is the landfill site which main process of the project are a LFG Collecting system, Pre-treatment system and Electricity generation system. But project participant should provide more document for pre-treatment system.</p> <p>PDD v.0; 2008.12.9) According to PDD v.0, pre-treatment system consisted with CSV, heat exchanger, H₂S remove, gas filter, CH₄ analyzer and blower. But CH₄ analyzer is not addressed <Fig. A-3>.</p> <p>PDD v.1; 2009.1.17) According to PDD v.1, pre-treatment system consisted with CSV, water separator, H₂S remover, gas filter, heat exchange and chiller, water separator and blower. We need clarification through onsite visit.</p> <p>Site visit; 2009.1.29) During observations of the physical site or equipment used in the process, project boundary was confirmed</p>	A.2.2	<p>PDD v.0; 2008.12.9) The location of CH₄ analyser was wrong and corrected.</p> <p>PDD v.1; 2009.1.17) It is erroneously recorded in the PDD PDD v.0) and composition with 7 units is correct</p>	<p>It has been confirmed that project boundary described in PDD is true through onsite visit and technical provider (Sejin ENG) interview (2009.1.29) for cross check following 1 PDD amendment.</p> <p>Therefore CL1 is closed.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>CL.2</p> <p>PDD v.0; 2008.12.9)</p> <p>The information regarding pre-treatment system and electricity generation system is not sufficient to decide whether it is good practice. Through additional documents submitted by participant, findings by audit team and technical expert interview, it is confirmed.</p> <p>However, clarification for gas analyzer and the technical specification of the generator must be included in the PDD</p> <p>And it is needed to be checked whether additional appliance (generator-no.1) planned will be also used one by same manufactory.</p>	<p>A.2.4-6</p>	<p>PDD v.0; 2008.12.9)</p> <p>Detailed specification and technical data regarding power generator has been submitted.</p> <p>All over the world, there are 4 manufacturers handling power generator- Deutz, Catterpillar, Waukesha, Jenbacher (the project). Of all others, the generator by Jenbacher which has up-to-date technology show the highest efficient output of generator compared with one of same capacity (950kW).</p> <p>Generator-No.1 planned additionally will be used (applied) JGS 320GS-L.L. Patented combustion systems, engine controls, and monitoring of GE's Jenbacher gas engines enable its power generation plants to meet stringent emission standards, while offering high levels of efficiency, durability, and reliability.</p> <p>Invoices for flow meter have been received as each of vortex and mass</p>	<p>Audit team has checked out that the applied technology is the good practice through detailed information of power generator and interview with technical expert. Also pre-treatment system is explained by technical provider interview</p> <p>Facts related to flow meter and gas analyzer has been explained through technical data and expert interview, and technical data related to power generator has been added in the PDD.</p> <p>Therefore CL2 is closed.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
provider of power generator about additional generator. We need detailed specification of additional power generator which planed to set up.		<p>and 2nd power generator were provided and addressed in the PDD</p> <p>PDD v.2. 2009.2.2)</p> <p>Detailed specification for additional power generator was provided and addressed in the PDD</p>	

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>CL.3</p> <p>PDD v.0; 2008.12.9) The information of equipment suppliers contracts is not clearly defined in the PDD</p> <p>PDD v.1; 2009.1.17) Onsite check regarding manual provided in the PDD is needed.</p>	A.2.7	<p>PDD v.0; 2008.12.9) The additional information was submitted and addressed in the PDD.</p>	<p>According to the system manual which is provided by equipment suppliers, items of operation and management is stated by specific unit and have been controlled by inter operational manual. Onsite staff have relevant career more than 10 years in applied area. They are experts who have been received training for system from GE, and will be performed without change in personnel. The plan of training for new personnel is defined in the internal operation manual. Therefore CL3 is closed.</p>
<p>CL.4</p> <p>PDD v.0; 2008.12.9) The current configuration at Mokpo Landfill comprises passive venting with no burning. This landfill gas venting system is used only for observance of law, Waste Control Act of Korea, which regulate establishment of venting system for appropriate gas treatment and safety purposes. Because no methane destruction is occurring in the baseline scenario and the regulatory requirements do not indicate any specific amount of gas collection and destruction or utilization of landfill gas. Waste Control Act of Korea just sated that it should establish facility of</p>	B.2.2	<p>PDD v.0; 2008.12.9) The explanation related to AF has been provided in the PDD.</p>	<p>The revision of PDD is deemed sufficient. Therefore CL4 is closed.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>incineration or power generation /utilization. An adjustment factor (AF) of 0% was adopted However AF is not mentioned regarding estimate of MD_{req,y} in the PDD,. Therefore, Clarification is needed why the Adjustment Factor has determined as 0 %.</p>			

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
Explanation related to methodology used in PDD/B.7 is not added.		It added in the PDD v.3	
<p>CL.8 PDD v.0; 2008.12.9) According to ACM0001/verion10 CO₂ emissions resulting from the use of electricity in extracting, pumping and pre-treatment, the landfill gas should be accounted as project emissions and included in the emission reduction calculations respectively. But emission form on-site electricity use is not stated.</p> <p>PDD v.1; 2009.1.17) According to electricity invoice (provided by KEPCO at October and November, 2008) based on emissions from on-site electricity use, additional information is needed because it is difficult to generalize statically by insufficiency of information and wide fluctuation of values.</p> <p>PDD v.2; 2009.2.2) Additional data from participant is insufficient and needed to revise.</p>	<p>B.8.1-4 B.3.1 B.4.2</p>	<p>PDD v.0; 2008.12.9) There are emissions from on-site electricity use, which is used energy source for blower and starting power plant. Self consumption ratio (3%) involved baseline emission in invoice is considered that, but there exists imported electricity.</p> <p>PDD v.1; 2009.1.17) Invoice of imported electricity of December (provided by KEPCO) has been provided. After cross-check through external benchmarking data, it will be added in the PDD.</p> <p>PDD v.2; 2009.2.2) The additional information has been provided</p>	<p>Through investigation, direct project emission source is identified So CL8 is closed</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CL.9 PDD v.0; 2008.12.9) Although the PDD mentions a team assigned to monitor emission reductions, organization involved of each team is not clearly provide.	B.11.1	PDD v.0; 2008.12.9) The PDD was revised.	Organization involved and role is clarified. CL9 is closed.
CL.10 PDD v.0; 2008.12.9) Authority and responsibility of each team stated at <Figure B-2>and person in charge which is stated at <Table B-15> is different.	B.11.2	PDD v.0; 2008.12.9) The PDD was revised.	The PDD is revised. CL10 is closed.
CL.11 PDD v.0; 2008.12.9) An identified procedure related to training of monitoring personnel is not mentioned and this also needs to be verified during verification.	B.11.3	PDD v.0; 2008.12.9) The PDD was revised.	A procedure for training of monitoring personnel is stated in the revised PDD and confirmed that by onsite visit. Training of monitoring is planned that staff completed the first training by GE receive internal/external training periodically. CL11 is closed.
CL.12 PDD v.0; 2008.12.9) Actually there is a emergency procedure of the landfill but without CDM project No emergency procedures in case of unintended emissions of LFG were evidenced	B.11.4	PDD v.0; 2008.12.9) Relevant guidance applied at test-operation exits in site and staffs have obeyed it. This was added in the PDD.	Existence of procedures is stated in the revised PDD. This is confirmed by emergency procedure through onsite visit. CL12 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>CL.13 PDD v.0; 2008.12.9) No calibration procedures provided in PDD Calibration procedures need to be defined in the PDD.</p> <p>PDD v.1; 2009.1.17) No calibration procedures provided in PDD related to flow meter, gas analyzer Calibration procedures related to flow meter, and gas analyzer need to be provided in the PDD</p> <p>Calibration procedures related to flow meter and gas analyzer have not been provided to audit team</p>	B.11.5	<p>PDD v.0; 2008.12.9) Flow meter has just been selected and the PDD is revised regarding that.</p> <p>PDD v.1; 2009.1.17) The PDD has been revised.</p>	<p>Calibration procedures related to flow meter and gas analyzer have been provided to audit team and provided in the PDD v.2. Therefore CL13 is closed.</p>
<p>CL.14 PDD v.0; 2008.12.9) No maintenance of monitoring equipment and installations procedures have been mentioned in the PDD</p> <p>PDD v.1; 2009.1.17) Procedure of power generator has been checked through onsite visit but additional</p>	B.11.6	<p>PDD v.0; 2008.12.9) The additional information has been provided.</p> <p>PDD v.1; 2009.1.17) The PDD has been revised and manual</p>	<p>Relevant procedures have been stated in the revised PDD v.2. Therefore CL14 is closed.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>information related to flow meter and gas analyzer is needed.</p> <p>Maintenance evidences of monitoring equipment and installations procedures regarding flow meter and gas analyzer are not provided.</p>		was provided	
<p>CL.15</p> <p>PDD v.0; 2008.12.9)</p> <p>In addition to procedure for measurement, procedure for reporting is needed to clarify.</p>	B.11.7	<p>PDD v.0; 2008.12.9)</p> <p>The additional information has been provided.</p>	<p>Relevant each procedure has been stated in revised PDD. And this is verified by onsite visit.</p> <p>CL15 is closed.</p>
<p>CL.16</p> <p>PDD v.0; 2008.12.9)</p> <p>Procedure of handling for uncertainty of monitoring is needed to mention.</p> <p>PDD v.1; 2009.1.17)</p> <p>Procedures is not provided to audit team</p>	B.11.9	<p>PDD v.0; 2008.12.9)</p> <p>The additional information has been provided.</p> <p>PDD v.1; 2009.1.17)</p> <p>The PDD has been revised and manual was provided</p>	<p>Procedures is provided to audit team</p> <p>CL16 is closed.</p>
<p>CL.17</p> <p>PDD v.0; 2008.12.9)</p> <p>Procedure of internal audit is needed to mention.</p>	B.11.10	<p>PDD v.0; 2008.12.9)</p> <p>The additional information has been provided.</p>	<p>Revised PDD stated regarding their each procedure. And this is verified by onsite visit.</p> <p>CL17 is closed.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CL.18 PDD v.0; 2008.12.9) The Procedure for examination related to performance of project is not stated.	B.11.11	PDD v.0; 2008.12.9) The PDD was revised.	Revised PDD stated regarding their each procedure. And this is verified by onsite visit. CL18 is closed.
CL.19 PDD v.0; 2008.12.9) The Procedure for calibration is not stated.	B.11.12	PDD v.0; 2008.12.9) The PDD was revised.	Revised PDD has been stated regarding their each procedure. And this is verified by onsite visit. CL19 is closed.
CL.20 PDD v.0; 2008.12.9) Emitters from on-site electricity use sources are from blower and at start power plant. Self consumption ratio (3%) involved baseline emission in invoice is considered that, but there exists imported electricity. This should be identified. PDD v.1; 2009.1.17) Additional information from participant is not sufficient and needed to supply. Additional data submitted from participant is insufficient and needed to check out.	B.3.4	PDD v.0; 2008.12.9) Additional information was provided. PDD v.1; 2009.1.17) Additional information(bench-marking data) was provided.	Additional data submitted from participant is sufficient. CL20 is closed
CL.21 PDD v.0; 2008.12.9)	B.3.6		So CL21 is closed

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
Explanation for uncertainty when estimating PE is not stated.		PDD v.0; 2008.12.9) Additional explanation was supplied.	
CL.22 PDD v.0; 2008.12.9) Internal analysis of the environmental impacts was performed and as a result, this project will not bring significant environmental impacts. Detailed information is needed to mention in the PDD. And the additional document related to performance inspection, which should be received every three years based on Waste Control Act section 30 of 1 and 2 should be confirmed. Detailed descript for “Air” in the PDD(p.13) is needed to revise.	D.1.4	PDD v.0; 2008.12.9) Detailed descript for “Air” in the PDD(p.13) is a typing error and revised. Results of internal analysis of the environmental impacts by odor, fugitive dust and noise have been provided. There are no sources of fugitive dust. The building equipped soundproof facilities to reduce noise, so the noise is controlled under the legal standard. By using “good practice” such as solid desulphurization facilities, It is checked out that H2S is not detected. Certificates (Jan.2009) of Korea Testing & research Institute are submitted as Its reference data.	Additional information is deemed sufficient. So CL22 is closed.
CL.23 PDD v.0; 2008.12.9) In the PDD, it is mentioned that the proposed project activities were announced in the local newsletter and Mokpo Metropolitan City stakeholder’s and Mokpo has held a meeting	E.1.1	PDD v.0; 2008.12.9) The additional information was provided.	The additional information from participant and stakeholder interview is deemed sufficient. CL23 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
to describe the proposed project and visited project site with 42 participants and stakeholders on November 2006. However no detailed relevant information is needed to provide in evidence such as time of meeting, related document and photos or video recodes.			
<p>CL.24 PDD v.0; 2008.12.9) EL_{IMP,PJT,y} is included in monitoring indicators, so value of PE is expected. However, PE stated as “0” in the PDD and should be needed to describe.</p> <p>PDD v.1; 2009.1.17) According to revised PDD and additional information from participant and onsite visit, there are no project emissions except by pre-treatment system and at starting power. And it is measured continuously by the measurement instruments and electric power could be monitored transparently through the electric meter of Korea Electric Power Corporation. Therefore choice of indicator is reasonable.</p>	B.6.3	<p>PDD v.0; 2008.12.9) PE which was omitted by mistake was provided.</p> <p>.</p>	<p>The choice of indicators is deemed reasonable. Therefore CL24 is closed.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>CL.25 PDD v.0; 2008.12.9) Available information is needed to submit.</p> <p>PDD v.1; 2009.1.17) The flow meter which is double cost than existing domestic appliances and high level of efficiency is selected. The choice for gas analyzer is not completed and needed to check later.</p>	B.10.4	<p>PDD v.0; 2008.12.9) The information related to flow meter was provided.</p> <p>PDD v.1; 2009.1.17) If the choice for gas analyzer is completed within Feb, relevant information will be provided.</p> <p>PDD v.2; 2009.2.2) The information related to gas analyzer was provided</p>	CL25 is closed.
<p>FAR.1 PDD v.0; 2008.12.9) According to Clean Air Conservation Act in the Ministry of Environment, regarding post-management of project, because LFG utilizing facilities for generating electricity which are more than 120kW level have to operate them under emission standards, there should be documents whether they obey the standards or not and what to do next.</p>	D.1.2	<p>PDD v.0; 2008.12.9) By current law, Mokpo landfill gas utilization facility has come under air pollutants emission facility since 1st Jan.2010. Currently facilities for generating electricity using LFG have just to obey the legal standard regarding emission of NO₂. The limit emission is 50ppm, but</p>	<p>Audit team verified that continuous monitoring will be performed and additional control facility is planned if there is an excessive level of emission.</p> <p>Project participants must update continuously their regularization plan. And this need to be confirmed during verification</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		<p>facilities using LFG or biogas have been applied 125ppm until 31st December 2009.</p> <p>Value of Actual measurement is 47ppmNO₂ and within the law.</p> <p>It should be checked air pollutants density by periodic re-measurement and confirmed whether they obey the standards or not and if it is needed, air pollutants control facilities will be constructed.</p>	