




Verification and certification report form for CDM project activities

(Version 01.0)

Complete this form in accordance with the "Attachment: Instructions for filling out the verification and certification report form for CDM project activities" at the end of this form.

VERIFICATION AND CERTIFICATION REPORT

Title of the project activity	Mokpo Landfill Gas Recovery Project for Electricity Generation
Reference number of the project activity	2834
Version number of the verification and certification report	Version 2.0
Completion date of the verification and certification report	12 May 2016
Monitoring period number and duration of this monitoring period	Monitoring period number : 6th Duration : 19/12/2014~31/12/2015
Version number of monitoring report to which this report applies	Version 2.0
Crediting period of the project activity corresponding to this monitoring period	18/02/2010 to 17/02/2020
Project participant(s)	Hanwha Corporation
Host Party	Republic of KOREA
Sectoral scope(s), selected methodology(ies), and where applicable, selected standardized baseline(s)	<ul style="list-style-type: none"> • Sectoral scopes <ul style="list-style-type: none"> - Scope 1: Energy industry - Scope 13: Waste handling and disposal • Selected methodologies <ul style="list-style-type: none"> - AMS I.D: Grid connected renewable electricity generation Version 13 - AMS III.G: Landfill methane recovery Version 06
Estimated GHG emission reductions or net anthropogenic GHG removals for this	<ul style="list-style-type: none"> • Amount for a full year as per PDD: 25,795 tCO_{2e} • Corresponding amount for the monitoring period (378 days): 27,348 tCO_{2e}

monitoring period in the registered PDD	
Certified GHG emission reductions or net anthropogenic GHG removals for this monitoring period	52,030 tCO _{2e}
Name of DOE	Korean Foundation for Quality
Name, position and signature of the approver of the verification and certification report	<p>Soon Hong YEOM Sustainability Management Institute Managing Director</p> 

SECTION A. Executive summary

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Korean Foundation for Quality (KFQ) has performed periodic verification of the CDM project 'Mokpo Landfill Gas Recovery Project for Electricity Generation' in Republic of Korea. UNFCCC Registration Ref. No. of this project activity is 2834 and duration of this 6th monitoring period is 19/12/2014 ~ 31/12/2015. This report contains the findings from the verification and a certification statement for the certified emission reductions.

Verification objective

Verification is the periodic, through and independent assessment and ex-post determination by a Designated Operational Entity (DOE) of the monitored reductions in GHG emissions that have occurred as a result of the registered CDM project activity during a defined monitoring period. Certification is the written assurance by a DOE that, during a specific period in time, a project activity achieved the emission reductions as verified.

The objective of this verification was to verify and certify emission reductions reported for the 'Mokpo Landfill Gas Recovery Project for Electricity Generation' for the period in accordance with paragraph 62 of CDM modalities and procedures.

Verification scope

The scope of the verification is to verify that:

- The project activity has been implemented and operated in accordance with the registered PDD or any approved revised PDD and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place.
- The monitoring report and other supporting documents provided are completed in accordance with the latest applicable version of the completeness checklist for requests for issuance of CERs and verifiable and in accordance with applicable CDM requirements.
- The monitoring plan complies with the monitoring methodology and the actual monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan and the approved methodology including applicable tools and compliance with any guidance provided by the Board regarding deviations from the provisions of a registered plan and/or methodology.
- Data is recorded and stored as per the monitoring methodology AMS I.D (version 13), AMS III.G (version 06) and the calculation of GHG emission reductions have been assessed to correctly support the emission reductions being claimed.

Furthermore, it was KFQ's objective to identify any concerns related to the conformity of the actual project activity and its operation with the registered project design document and determine

whether any deviation or proposed or actual changes in the implementation or operation of the project activity comply with the requirements of the Project Standard.

The verification shall ensure that reported emission reductions are complete and accurate in order to be certified. The verification is incorporating both quantitative and qualitative information on emission reductions.

Verification process

KFQ has made publicly available the monitoring report received from the project participants. Only verification activities after the publication of the monitoring report on the UNFCCC CDM website have been used as a basis for conclusion of verification.

The verification process included desk review of the monitoring report published (and any updated versions, if available), emission reduction calculation spreadsheets and other supporting documents and data. Further, onsite assessments and interviews with those involved in project management and operations are conducted. This is followed by preparation of draft verification report summarizing desk review and on-site assessment findings (i.e. CARAS, CLs, and FARs). Upon successful closing of the CARs and CLs raised (in any), the final verification report is prepared. The final report then undergoes a technical review and final approval according to KFQ's internal quality assurance procedures.

The data presented in the monitoring report were assessed by review of the detailed project documentation and production records, as well as by interviews with personnel at Hanwha Corporation, and observation of collection of measurements, observation of established monitoring and reporting practices and assessment of the reliability of monitoring equipment. This has enabled the verification team to assess the accuracy and completeness of reported monitoring results, as well as to verify the correct application of the approved monitoring methodology. Furthermore, this has enabled the verification team to assess and determine that the implementation and operation of the project activity as well as the steps taken to report emission reductions in compliance with the CDM criteria and relevant guidance provided by the Board.

In addition, all parameters, as required (and as applicable) by the monitoring methodology AMS I.D(version 13) and AMS III.G(version 06) as well as the monitoring plan and the management system were assessed during the site visit.

Description of the project activity

Project Title	Mokpo Landfill Gas Recovery Project for Electricity Generation	
UNFCCC Registration Number	2834	
Project Party	Republic of Korea(Host)	
Project Participant	Hanwha Corporation	
Baseline and monitoring methodology	AMS I.D: Grid connected renewable electricity generation (version 13) AMS IIIG: Landfill methane recovery (version 06)	
Location of the project	Address	Daeyang-dong, Mokpo City, Jeollanam-do, Republic of Korea
	GPS Coordinates	Longitude : 126.4096 Latitude : 34.8328
Date of registration	18/02/2010	
Crediting period	18/02/2010 ~17/02/2020	
Monitoring period of this verification	19/12/2014 ~ 31/12/2015 (378 days)	

Mokpo Landfill Gas Recovery Project for Electricity Generation is developed by Hanwha Corporation in the Republic of Korea. Mokpo Landfill was constructed in 1995 as a municipal solid waste (MSW) landfill and total area of it is 290,490 m².

The purpose of this project is to collect and utilize CH₄ (as a renewable energy) for electricity generating at the landfill site. Two generators are installed with a total capacity of 2.123 MW (1.065MW and 1.058MW) and the generating electricity from the project is exporting to a Grid.

The physical components including the equipment for collecting LFG, generating electricity, measuring LFG and generated electricity were confirmed as per revised and approved PDD version 05. (PDD version 05 is completed on 29 November 2013 and it was approved on 6 March 2014;herein after revised PDD).

Conclusion

KFQ has performed the verification of the emission reductions reported for the project activity 'Mokpo Landfill Gas Recovery Project for Electricity Generation' in Korea (UNFCCC Registration Ref. No. 2834) for the period 19/12/2014 to 31/12/2015.

The verification of the emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project. All relevant records of data from the Hanwha Corporation System and records from the production logs of the nitric acid production have been examined and verified for the reporting period.

The verification team has during its preparations identified the key reporting risks and used the assessment to determine to which extent the project operator's control systems were adequate for mitigation of these key reporting risks. In addition, other areas that can have an impact on reported emission reductions have also undergone detailed audit testing.

KFQ also confirms that the GHG emission reductions are calculated without material misstatements. Our opinion refers to the project's GHG emissions and resulting GHG emission reductions reported, both determined using the valid and revised project's baseline, its monitoring plan and its associated documents.

The implementation of the project resulted in 52,030 tCO_{2e} of emission reductions during the period from 19/12/2014 to 31/12/2015 which is within the fixed crediting period from 18/02/2010 to 17/02/2020. In our opinion, the GHG emission reductions reported for the project in the monitoring report (Version 2.0) are fairly stated. The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology AMS I.D (version 13), AMS III.G (version 06) and the monitoring plan contained in the Project Design Document (version 05 dated 29 November 2013).

KFQ is able to certify that the emission reductions from the 'Mokpo Landfill Gas Recovery Project for Electricity Generation' in Korea during the period from 19/12/2014 to 31/12/2015 amount to 52,030 tonnes of CO_{2e}.

SECTION B. Verification team, technical reviewer and approver

B.1. Verification team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk review	On-site inspection	Interview(s)	Verification findings
1.	Team Leader(*)	IR	LEE	Mi Jung	KFQ	√	√	√	√
2	Verifier(*)	IR	Yoon	Sung Han	KFQ	√	√	√	√

3	Verifier	IR	CHO	Jin Seok	KFQ	√	-	√	√
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(*) means a personnel with technical expertise in technical are 1.2 and 13.1.

B.2. Technical reviewer and approver of the verification and certification report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1	Technical reviewer	IR	PARK	Sang Yeon	KFQ
2	Approver	IR	YEOM	Soon Hong	KFQ

Please refer to Appendix 2 below for demonstration of how the team meets the competence required for the verification.

SECTION C. Application of materiality

C.1. Consideration of materiality in planning the verification

No.	Risk that could lead to material errors, omissions or misstatements	Assessment of the risk		Response to the risk in the verification plan and/or sampling plan
		Risk level	Justification	
1	Number of Monitoring parameters	L	This project activity does not involve large number of monitoring parameters	In response of that risk, the KFQ verification team nevertheless included two verifiers in total and two of them conduct on-site inspection in order to cover/review all monitoring parameters in a complete and detailed manner.
2	Error rate in Monitoring report	L	Expert organization is involved in compilation of MR as well as calculation	In response of that risk, the KFQ verification team focuses on systematic consistency and error checks.
3	Familiarity with Monitoring system	L	This is 6th monitoring period. Personnel involved have worked more than 5 yrs.	In response of that risk, as part of the verification of KFQ in this project, the KFQ verification team will independently check the existence of monitoring instruments as well as their valid calibration.
4	QA/QC	L	Stable QA/QC system has been implemented.	In response to that risk, focus on crosschecking between raw data from data recording system. Review monitoring

				<i>manual and relevant procedures, for example, emergency procedures.</i>
5	<i>Data flow</i>	<i>M</i>	<i>Mainly transmitted to the spreadsheet automatically</i>	<i>In response to that risk, the KFQ verification team crosschecks raw data with spread sheet on a random sampling basis to ensure the functioning of transferring system.</i>
6	<i>Recalculation</i>	<i>M</i>	<i>Manually recalculated</i>	<i>In response to that risk, check all relevant cases. Allocate much time in the events check and re-calculation.</i>

KFQ's verification plan draws on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. KFQ planned the verification by obtaining evidence and other information and explanations that KFQ considers necessary to give reasonable assurance on the reported GHG emission reductions on the basis of risk level identified and materiality concept in accordance with 'Guideline of application of materiality in verification' (ver. 02).

C.2. Consideration of materiality in conducting the verification

Detected findings do not impact the amount of emission reductions and are thus immaterial. As these findings could be considered as simple error, not systematic reoccurring error, the verification team determined additional audit procedures should not be conducted in order to reach a reasonable level of assurance that the claimed emission reductions in the MR are free from material error, omission or misstatement. Accordingly, verification and sampling plan were not revised.

SECTION D. Means of verification

D.1. Desk review

KFQ's verification is based on the monitoring documentation provided by the PP especially the monitoring report, (Version 1.0 dated 16/03/2016 (published on 17/03/2016) and Version 2.0 dated 20/04/2016) and the CDM Project spreadsheets. Furthermore, the revised PDD and validation report were reviewed as well as the monitoring plan, previous verification reports, the applied baseline and monitoring methodology and any other information and references relevant to the project activity's emission reductions (e.g. IPCC reports, etc.). A complete list of all documents

reviewed is shown in Appendix 3 of this verification report. KFQ's verification process takes into consideration all the CDM Rules and Guidance applicable to the project activity, e.g. Clean Development Mechanism Validation and Verification Standard, Clean Development Mechanism Project Standard, Clean Development Mechanism Project Cycle Procedure, Post Registration Changes and Request for Issuance: Completeness checklist, Post Registration Changes and Request for Issuance: Information and reporting checklist and relevant decisions, clarifications and guidance from the CMP and the CDM EB.

During the desk review, KFQ has applied standard auditing techniques to assess the quality of information provided. The following activities were performed:

- verify the compliance of the MR with the guidance for completing the monitoring report form;
- verify the completeness of the data and the information presented in the MR;
- review the monitoring plan contained in the revised PDD and monitoring methodology. Check the compliance of the MR with respect to the monitoring plan and verify that the applied methodology was carried out. Particular attention to coverage of all monitoring parameters, the frequency of measurements, the quality of the metering equipment including calibration requirements, and the quality assurance and quality control procedures was paid;
- review the calculations and assumptions used to obtain the GHG data and ER;
- evaluate the data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

D.2. On-site inspection

Detailed verification of all data contained in the monitoring report was performed during the site visit at Hanwha Corporation on 07/04/2016. During the site visit, the personnel were interviewed or assisted the verification team. During the on-site assessment, KFQ has applied standard auditing techniques to assess the quality of information provided. The following aspects of the CDM project activity have been confirmed:

- The implementation and operation of the CDM project activity;
- The information flow for generating, aggregating, recording, calculation and reporting of the monitoring parameters; and
- The operational and data collection procedures and their implementation in accordance with the monitoring plan.

Further, the following activities were performed:

- A cross-check between information provided in the monitoring report and data from other sources such as plant log books, inventories, purchase records or similar data sources;
- A check of the monitoring equipment including calibration performance and observations of monitoring practices against the requirements of the PDD, the monitoring plan and AMS I.D(version 13) and AMS III.G(version 06);
- A review of calculations and assumptions made in determining the GHG data and emission reductions; and
- An identification that quality control and quality assurance procedures are in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.

Duration of on-site inspection: 07/04/2016				
No.	Activity performed on-site	Site location	Date	Team member
1.	Confirmation of the correct & complete implementation and operation of the Project Activity and check of all physical features as described in the PDD are in place.	Mokpo	07/04/2016	Mi Jung LEE Sung Han YOON
2	Review of the complete data flow from data generation, aggregation, recording, calculation to reporting of the monitoring parameters.	Mokpo	07/04/2016	Mi Jung LEE Sung Han YOON
3	Confirmation of the complete & correct implementation of procedures for the operation and data collection.	Mokpo	07/04/2016	Mi Jung LEE Sung Han YOON
4	Verification of the information provided in the MR and documentation with other sources.	Mokpo	07/04/2016	Mi Jung LEE Sung Han YOON
5	Check of the monitoring equipment against the PDD, the monitoring plan as well as the approved methodology, including check of calibration & maintenance, etc. in relation to that equipment.	Mokpo	07/04/2016	Mi Jung LEE Sung Han YOON
6	Identification whether suitable QA/QC procedures are in place in order to prevent errors or to enable the corrections of errors and omissions in the reported parameters.	Mokpo	07/04/2016	Mi Jung LEE Sung Han YOON

D.3. Interviews

A list of the persons interviewed during this verification activity is included in Table below.

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1	LEE	Kun Hong	Hanwha Corporation	07/04/2016	<ul style="list-style-type: none"> - General support - Changes of project design and implementation since last verification - Compliance of the monitoring plan with the monitoring methodology - Technical equipment and operation - Monitoring data - Data uncertainty and residual risks - Management & operational systems - GHG calculation and reporting procedures - Compliance with National laws and regulations 	Mi Jung LEE Sung Han YOON
2	MOON	Seon Young	Roen Consulting. Co., Ltd.	07/04/2016	<ul style="list-style-type: none"> - Monitoring data - Data uncertainty and residual risks - GHG calculation and reporting procedures - Compliance with National laws and regulations 	Mi Jung LEE Sung Han YOON
3	LEE	Kyu Hong	Roen Consulting. Co., Ltd.	07/04/2016	<ul style="list-style-type: none"> - Monitoring data - Data uncertainty and residual risks - GHG calculation and reporting procedures - Compliance with National laws and regulations 	Mi Jung LEE Sung Han YOON

D.4. Sampling approach

As per the requirements set out in VVS (Version 9.0), random sampling has been applied as relevant for the present case in the Project Activity, where no sampling approach was applied by the project participants.

Since automatic transferred system to the spreadsheet is in place, cross check the data in the spreadsheet against raw data was done based on random sampling after confirming safeguard measure for raw data in DCS server and transferring system.

Detecting findings impacts the amount of emission reductions but are immaterial. As these findings could be considered as simple error, not systematic reoccurring error, the verification team determined additional audit procedures did not need to be conducted in order to reach a reasonable level of assurance that the claimed emission reductions in the MR are free from material error, omission or misstatement. Accordingly, verification and sampling plan were not revised.

Whereas recalculations for all events, the locations, calibrations of all measurement instruments and intervals (Measuring frequency, Reading frequency, Recording frequency) were assessed. All data recorded manually were also verified.

D.5. Clarification requests, corrective action requests and forward action requests raised

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
Compliance of the monitoring report with the monitoring report form	-	-	-
Compliance of the project implementation with the registered/revised PDD	-	-	-
Post-registration changes	-	-	-
Compliance of the monitoring plan with the monitoring methodology including applicable tool and standardized baseline	-	-	-
Compliance of monitoring activities with the registered monitoring plan	-	1	-
Compliance with the calibration frequency requirements for measuring instruments	1	-	-
Assessment of data and calculation of emission reductions or net removals	-	-	-
Others (management system)	-	-	-
Total	1	1	-

The objective of this phase of the verification was to resolve any issues which needed to be clarified prior to KFQ's conclusion that i) the project activity has been implemented and operated in accordance with the registered PDD or any approved revised PDD, ii) the monitoring plan complies with the monitoring methodology and the actual monitoring complies with the monitoring plan including any guidance provided by the Board regarding deviations from the provisions of a registered/revised plan and/or methodology and iii) the data and calculation of GHG emission reductions are correct.

A corrective action request (CAR) is issued, where:

- i. Non-conformities with the monitoring plan or methodology are found in monitoring and reporting has not been sufficiently documented by the project participants, or if the evidence provided to prove conformity is insufficient;
- ii. Modifications to the implementation, operation and monitoring of the registered project activity has not been sufficiently documented by the project participants;
- iii. Mistakes have been made in applying assumptions, data or calculations of emission reductions which will impair the estimate of emission reductions;
- iv. Issues identified in a FAR during validation or previous verification(s) to be verified during next verification have not been resolved by the project participants.

A clarification request (CL) shall be raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

A forward action request (FAR) is issued for actions if the monitoring and reporting require attention and/or adjustment for the next monitoring period.

All findings were satisfactorily addressed by the project participant in the monitoring report.

SECTION E. Verification findings

E.1. Compliance of the monitoring report with the monitoring report form

Means of verification	KFQ has checked the monitoring report provided by the PP against the latest monitoring report form in order to determine, whether the monitoring report is in compliance with it.
Findings	The PP submitted the monitoring report (version 1.0 of 16/03/2016) to DOE applying the Monitoring Report Form Version 05.1. It is identified during document review that the MR has no blank section.
Conclusion	The verification team concludes that the the monitoring report (version 2.0) is in compliance with the latest the Monitoring Report Form (Version 05.1) and instruction therein.

E.2. Remaining forward action requests from validation and/or previous verification

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FAR was not issued from previous verification.

E.3. Compliance of the project implementation with the registered project design document

Means of verification	<u>Physical project implementation</u> During the on-site visit, the KFQ verification team visually inspected the installations of project activity as well as all instrumentation necessary for the monitoring of the
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	<p>emission reductions including the data collection system and storage against the revised PDD (Version 05, 29 November 2013) and monitoring plan. Also the KFQ verification team reviewed the documentation regarding operation especially any events occurred during this monitoring period and management of monitoring instruments especially its calibration and maintenance.</p> <p><u>Project operation</u></p> <p>The verification team checked the daily raw data of flow rate and methane fraction, daily/weekly/monthly electricity export records, monthly bills of electricity import, maintenance & calibration history, and event log files including daily work log recorded manually. In addition to this, verification team interviewed relevant plant staff to hear actual operation especially events occurred such as maintenance and error in monitoring system to understand project activity status during this monitoring period.</p> <p><u>Management system and quality control and quality assurance</u></p> <p>The operation procedures and QA/QC procedures and respective reports have been reviewed by the KFQ verification team. Furthermore latest organizational arrangements were checked by the means of interviews with relevant staff from Hanwha Corporation.</p>
Findings	<p><u>Physical project implementation</u></p> <p>The purpose of this project activity is to collect and utilize LFG for electricity generation with 1.065MW and 1.058MW generator respectively at the landfill site. As this landfill site is still reclamation, management of LFG collecting system is required to collect LFG efficiently and to maintain optimum condition to capture methane. Therefore re-location of existing wellhead and/or new wellhead is needed.</p> <p>However, for this monitoring period, there were no added or removed wellhead therefore total 13 wellheads and 150 vertical well were being operated since May 2014. This number is different as described in the revised PDD but it is very natural change to operate landfill site from the point of view of an expert.</p> <p>The verification team confirmed through visual inspection that all physical features of the CDM project activity including data collection systems and storage have been implemented in accordance with the revised PDD (version 05).</p> <p><u>Project operation</u></p> <p>During this monitoring period, there was no noticeable/specific event. However there were several operational events such as maintenance of generators and error in the monitoring system. In such cases, flow rate and methane concentration data were not monitored and/or recorded so emission reduction for certain period was not claimed. Verification team checked these operational events described in the monitoring report by reviewing the daily reports, event log files and interview person in charge of operation at the project site.</p> <p>The monitoring system and data collection system were fairly operated during this monitoring period and verification could confirm that events described in the monitoring report are complete.</p>

	<p><u>Management system and Quality assurance</u></p> <p>LFG plant manager is responsible person to ensure the quality and accuracy of the measured data. All measured data related to the emission reduction calculation are analyzed and evaluated by Hanwha Corporation.</p> <p>Data handling solutions involve redundancy check, data manipulation protection, integrity check as well as proper archiving.</p> <p>Through interview with involved personnel at on-site and document review, the verification team confirms that Management system and Quality assurance related procedures have implemented as described in the revised PDD.</p>
Conclusion	<p>KFQ confirms that the project has been implemented according to the description in the revised PDD. The raised CL (ID 01) has been completely resolved.</p> <p>The verification team specifically confirms that:</p> <ul style="list-style-type: none"> • All physical features of the proposed CDM project activity including data collection systems and storage are in place and in accordance with the revised PDD; and • All other relevant information provided in the monitoring report is fully in accordance with respective information stated in the revised PDD; and • The information on project operation, the management system and quality assurance are complete, correct and in accordance with the revised PDD; <p>and</p> <ul style="list-style-type: none"> • The management system and quality assurance and related procedures have implemented as described in the monitoring report and in accordance with the revised PDD.

E.4. Post-registration changes

E.4.1. Temporary deviations from the registered monitoring plan, monitoring methodology or standardized baseline

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There were no post registration changes identified by verification team during this verification.

E.4.2. Corrections

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There was no correction identified by verification team during this verification.

E.4.3. Changes to the start date of the crediting period

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There were no changes to the start date of the crediting period identified by verification team during this verification.

E.4.4. Inclusion of a monitoring plan to a registered project activity

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There was no inclusion of a monitoring plan to the registered project activity identified by verification team during this verification.

E.4.5. Permanent changes from registered monitoring plan, monitoring methodology or standardized baseline

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There were no permanent changes from registered monitoring plan, monitoring methodology or standardized baseline identified by verification team during this verification. However, there was PRC during 4th verification (Prior approval by CDM EB was not required) and it was approved on 06 March 2014 which is within 5th monitoring period.

E.4.6. Changes to the project design of a registered project activity

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There were no changes to the project design of a registered project activity identified by verification team during this verification. However, there was PRC during 4th verification (Prior approval by CDM EB was not required) and it was approved on 06 March 2014 which is within 5th monitoring period.

E.4.7. Types of changes specific to afforestation and reforestation project activities

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Not applicable

E.5. Compliance of monitoring plan with the monitoring methodology including applicable tool and standardized baseline

Means of verification	The monitoring plan contained in the revised PDD, version 5 dated 29 November 2013 and the post-registration changed accepted by the CDM EB on 6 March 2014 (PRC-2834-001) were reviewed against the approved methodology, AMS I. D (version 13) and AMS III.G (version 06) applied by the project activity.
Findings	The KFQ verification team found that there were no incompliance between the monitoring plan contained in the revised PDD, the applied methodology, AMS I. D (version 13) and AMS III.G (version 06). It was found that there was no standardized baseline applied in the project activity.
Conclusion	KFQ confirms that the monitoring plan in the revised PDD are in accordance with the approved methodologies, AMS I. D (version 13) and AMS III.G (version 06) applied by the project activity.

E.6. Compliance of monitoring activities with the registered monitoring plan**E.6.1. Data and parameters fixed ex ante or at renewal of crediting period**

Means of verification	'Data and parameters fixed ex-ante' for the project activity have been reviewed against the revised PDD and the post-registration changes accepted by the CDM EB.			
Findings	Data and parameters fixed ex ante and generally relevant for the project activity.			
	Data/parameter (unit, description)	Source of data	Value(s) applied	Assessment
	Operation Margin Emission Factor(EF_{OM}) · Unit: ton CO _{2e} /MWh · Description: The generation-weighted average of CO ₂ emission per electricity unit generated by the existing grid-connected power plants	PDD (Version 05) - It was originally adopted from the 'Statistics of Electric Power in Korea'.	0.6817	Crosschecked with the value in the revised PDD.
	Build Margin Emission Factor(EF_{BM}) · Unit: ton CO _{2e} /MWh · Description: The generation-weighted average of CO ₂ emission per electricity unit generated by the additionally constructed power plants.	PDD (Version 05) - It was originally adopted from the 'Statistics of Electric Power in Korea'.)	0.3933	Crosschecked with the value in the revised PDD.
	CO ₂ Emission intensity of the electricity displaced($CEF_{electricity}$) · Unit: ton CO _{2e} /MWh · Description: The weighted average of EF_{OM} and EF_{BM} .	PDD (Version 05) - It was originally adopted from the 'Statistics of Electric Power in Korea'.)	0.5375	Crosschecked with the value in the revised PDD.
Conclusion	KFQ confirms that there are 3 fixed ex-ante data/parameters for this project activity according to the revised PDD (version 5). Also verification team confirms that all these data/parameters are correctly and completely applied in emission reduction calculation.			

E.6.2. Data and parameters monitoredInformation flow& data collection system

Means of verification	<p>The KFQ verification team assessed the information flow and data collection system and by means of physical inspection of all major components of the information flow & data collection system as well as related documentation. Interviews with relevant staff were held in order to experience the system in action.</p> <p>Furthermore, the verification of the information flow (where applicable) for all monitoring parameters was successfully done by means of following documents and cross checks:</p> <p>Data generation and aggregation:</p> <ul style="list-style-type: none"> • Calibration records and certificates • Certificate of analysis of the standard test gas for analyzer calibration <p>Aggregation to recording:</p> <ul style="list-style-type: none"> • Daily and monthly exported electricity generation(From KPX website) • Sales receipt of electricity imported (From KEPCO) • Data cross check between values from monitoring meters and values in control room & data cross check between data server and daily work log. <p>Calculation and reporting:</p> <ul style="list-style-type: none"> • Crosscheck of implemented calculations in Excel sheets against the revised PDD formulae • Data cross check between monthly report generated by PP and Excel Sheets
Findings	<p>As stated in the monitoring report and verified by the KFQ verification team, common data flow systems have been used in the project activity for the following parameters:</p> <ul style="list-style-type: none"> • Amount of landfill gas combusted in power plants • Methane fraction in LFG • Total amount of exported electricity out of the project • Total amount of imported electricity to meet project requirement <p>For the amount of landfill gas combusted in the power plants, there are 3 flow meters.</p> <ul style="list-style-type: none"> • Main flow meter to measure total flow rate: F_a • Flow meter for generator 1: F_b • Flow meter for generator 2: F_c <p>Each flow meter sends signals continuously to the data server and the accumulated date are registered in electronic file continuously. As the type of flow meter is thermal mass flow meter, reading flow rate is automatically converting to normalized cubic meters.</p> <p>While the flow data is transferring to the server, data lag is occasionally occurring. In this case, spot data is not transmitting from the flow meter to the data server thus flow data is not recording. However as there are main meter to measure total flow, PP could read/measure total flow rate during certain time period of data lag as it measures accumulated flow rate.</p> <p>In case of methane fraction in LFG, gas analyzer sends signals continuously to the data server (centralized monitoring system) and it records in the data server with the same recording frequency of the LFG flow. As explained as above data lag is also occasionally occurring. In that case, PP takes conservative approach to adopt</p>

	<p>CH₄ concentration with a lower value comparing with measured data with previous measure data in every recording time. Furthermore in case of CH₄ concentration data was not transferred to the data server due to data server malfunction or maintenance of monitoring system, PP manually records the CH₄ concentration data every hour according to the emergency procedure in operating manual.</p> <p>Lastly for the electricity, amount of exported electricity is measuring by watt-hour meters connected to Korea Power Exchange (KPX) and imported electricity is measuring by watt-hour meter controlled by Korea Electric Power Corporation (KEPCO).</p> <p>It was found by the KFQ verification team, that the information flow & data collection system are fully functional and were so during whole verification period covered under this verification. Respective documents and results were made available to KFQ for verification.</p>
Conclusion	<p>The monitoring report listed each parameter required by the revised PDD. Information flow for each parameter is also provided in the monitoring report.</p> <p>The verification team confirms that the monitoring report includes all parameters and the monitored data at the interval required by the methodologies and the revised PDD.</p> <p>The monitoring has been carried out in accordance with the monitoring plan in the revised PDD. All parameters were monitored and determined as per the revised PDD.</p> <p>In conclusion, the verification team assessed the information flow and data collection system and confirms that it meets the monitoring requirements of the revised PDD as per approved methodologies, AMS I.D (Version 13) and AMS III.G (Version 06).</p>

Assessment on data/parameters

The table out of the CDM-VCR-FORM has been used for the assessment, following rows as needed have been added: Data-parameter, Unit, Description, Source of data used, Value(S).

Detailed assessment of each parameter is as below.

Data/Parameter	F
Data Unit	Not applied
Description	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
Source of data used	Written information from the operator of the solid waste disposal site and/or site visits at the solid waste disposal site
Value(s)	0
Means of verification	The verification team checked whether there were changes in the landfill management plan of the site and facilities for LFG treatment against revised PDD through waste management status data published by Ministry of Environment and physical site inspection.
Findings	The verification team confirms that there were no changes for LFG management and any fraction of methane captured and flared, combusted or use in another manner during this monitoring period. Thus, value for this factor is zero during this

	monitoring period.
Conclusion	KFQ confirms that the monitoring of this parameter has been carried out in accordance with the monitoring plan and any monitoring activities comply with it. KFQ confirms that monitoring results of this parameter are consistently recorded as per the frequency in revised PDD.

Data/Parameter	GWP_{CH4}
Data Unit	tCO _{2e} /tCH ₄
Description	Global Warming Potential (GWP) of methane, valid for the relevant commitment period
Source of data used	Decisions under UNFCCC and the Kyoto Protocol
Value(s)	25 (to be applied for the second commitment period of the Kyoto Protocol)
Means of verification	Verification team crosschecked GWP of CH ₄ used in emission reduction calculation with it in the 'Application of the global warming potentials to clean development mechanism project activities and programme of activities for the second commitment period of the Kyoto Protocol';.
Findings	No findings
Conclusion	KFQ confirms correct PP applied 25 for GWP of CH ₄ in emission reduction calculation for this monitoring period.

Data/Parameter	LFG _{electricity, y}			
Data Unit	Nm ³ /y			
Description	Amount of landfill gas combusted in power plant			
Source of data used	Gas flow meters			
Value(s)				
	Data	Measured LFG _{electricity, y} (Nm ³)		
		F _b	F _c	F _{b+c}
	19/12/2014~ 18/01/2015	354,777.2	46,396.8	401,174.0
	19/01/2015~ 18/02/2015	374,885.2	30,772.0	405,657.2
	19/02/2015~ 18/03/2015	349,161.5	22,505.3	371,666.8
	19/03/2015~ 18/04/2015	365,366.0	0.0	365,366.0
	19/04/2015~ 18/05/2015	320,608.0	48,593.5	369,201.5
	19/05/2015~ 18/06/2015	418,545.8	293.0	418,838.8
	19/06/2015~ 18/07/2015	358,779.0	33,413.1	392,192.1
	19/07/2015~	358,404.1	48,173.0	406,577.1

	18/08/2015			
	19/08/2015~ 18/09/2015	360,298.8	44,375.8	404,674.6
	19/09/2015~ 18/10/2015	348,151.0	41,276.6	389,427.6
	19/10/2015~ 18/11/2015	370,956.1	33,460.8	404,416.9
	19/11/2015~ 18/12/2015	387,564.5	4,975.6	392,540.1
	19/12/2015~ 31/12/2015	138,352.6	27,428.0	165,780.6
	19/12/2014~ 31/12/2015	4,505,849.8	381,663.5	4,887,513.3
Means of verification	<p>The validation team checked whether the monitoring activities in relation to this parameter comply with the monitoring plan by physically inspecting the applied measuring device and related equipment for data generation, aggregation, recording and reporting. Furthermore, the KFQ verification team performed data crosscheck between daily raw data downloaded from the server and the spreadsheet for emission reduction calculation.</p> <p>All results have been verified against the requirements out of monitoring plan and the applied methodology.</p> <p>Procedures and records on calibration, maintenance and QA/QC activities have been reviewed and checked against the requirements out of the monitoring plan and the applied methodology.</p>			
Findings	<p>Each flow meter(Fa: main meter, Fb: for 1st generator, Fc: 2nd generator) is reading flow rate(as the type of flow meter is thermal mass flow meter, reading flow rate is automatically converting to normalized cubic meters) every 10 seconds on average and sends signals continuously to the data server. And this data is recording in electronic file continuously. Thus flow rate could be checked in every 10 seconds in spreadsheet downloaded from the data server.</p> <p>While the flow data is transferring to the server, spot data may not transmit from the flow meter to the data server thus flow data could not be recorded due to data lag. In this case PP read total flow during the time period of data lag because the figure read by flow meter is accumulated flow data.</p> <p>During this monitoring period, data lag was occurred. Verification team checked data lag period and reviewed whether manually recorded data is correctly applied in the baseline emission calculation.</p> <p>Also when the generator for the project was not operated because of maintenance of equipment or error in monitoring system, the PP applied measured flow data as '0'.In addition to this, when the generator shifts to other generator the flow rate was applied as '0' due to measurement error. Verification team checked each event described as above and checked whether flow rate '0' is correctly applied to exclude it in baseline emission calculation.</p> <p>Such events explained in above are well displayed in Section B (See Table B-1), Implementation of project activity, of the Monitoring Report Version 2.0.</p>			

	Daily data of ' $F_b + F_c$ ' and ' F_a ' are also compared. The differences between these two reading data could not be exceeding maximum error range ($1,728 \text{ Nm}^3/\text{day}$: theoretical calculation with each flow meter's accuracy). On 20 April 2015, the difference between main flow meter and ' $F_b + F_c$ ' was $1,817.9 \text{ Nm}^3$ thus PP adopted lower flow data in conservative manner.
Conclusion	Verification team checked the daily work log, the operating manual, spread sheet of 'Mokpo_6th MR_2834_Emission Reduction' and raw data sheet of 'LFG flow rates & CH_4 fraction (Mokpo LFG plant)_date' and confirmed that all data applied to BE calculation are consistent and correct.

Data/Parameter	$W_{\text{CH}_4, v}$
Data Unit	%
Description	Methane fraction in LFG
Source of data used	Methane analyzer
Value(s)	55.48
Means of verification	<p>The measured methane fraction data is monitoring automatically and continuously by gas analyzer.</p> <p>The validation team checked whether the monitoring activities in relation to this parameter comply with the monitoring plan by physically inspecting the applied measuring device and related equipment for data generation, aggregation, recording and reporting. Furthermore, the KFQ verification team performed data crosscheck between daily raw data downloaded from the server and the spreadsheet for emission reduction calculation.</p> <p>All results have been verified against the requirements out of monitoring plan and the applied methodology.</p> <p>Procedures and records on calibration, maintenance and QA/QC activities have been reviewed and checked against the requirements out of the monitoring plan and the applied methodology.</p>
Findings	<p>In case of methane fraction in LFG, gas analyzer sends signals continuously to the data server (centralized monitoring system) and it records in the data server with the same recording frequency of the LFG flow.</p> <p>While transferring reading data from monitoring meter to the data server, data lag is occasionally occurring. In that case, PP takes conservative approach to adopt CH_4 concentration with a lower value comparing with measured data with previous measure data in every recording time. Verification team reviewed 'LFG flow rates & CH_4 fraction (Mokpo LFG plant ERP data)' to confirm whether this approach is conservative and applied correct value in baseline emission calculation.</p> <p>In case of CH_4 concentration data was not transferred to the data server due to data server malfunction or maintenance of monitoring system, PP manually records the CH_4 concentration data every hour according to the emergency procedure in operating manual. Thus verification team reviewed CH_4 concentration recorded</p>

	<p>hourly for such events to confirm methane analyzer functioned properly at that time through daily work log.</p> <p>Also during generator shifts, CH₄ concentration may not available due to measurement error. In that event PP applied CH₄ concentration as '0%' for emission reduction in a conservative manner.</p> <p>Entire events related to the description above are well in Section B (See Table B-1), Implementation of project activity, of the Monitoring Report Version 2.0 and verification team checked it through 'LFG flow rates & CH₄ fraction (Mokpo LFG plant ERP data), daily work log. Also verification team checked that methane fraction in LFG is calculated as weighted average CH₄ concentration based on confirmed raw data to calculate baseline.</p> <p>[CAR 1] From 25th March 2015 to 27th March 2015, calibration of the gas analyser was conducted thus measured methane concentration shall be excluded in calculation of weighted average methane concentration for this monitoring period due to methane concentration within this period is measured under unstable status.</p>
Conclusion	<p>Regarding to CAR 1, PP excluded methane concentration measured within above period to calculated $W_{CH_4,y}$ and previous $W_{CH_4,y}$ was became 55.48%.</p> <p>KFQ verification team confirmed that 55.48% is correctly calculated based on reliable raw data and applied in the baseline emission calculation and calculation process was checked</p>

Data/Parameter	EL_{EXP,PJT,Y}			
Data Unit	MWh			
Description	Total amount of exported electricity out of the project			
Source of data used	Watt-hour meter			
Value(s)	Date	Wa	Wc	Total EL _{EXP} (MWh)
	19/12/2014~18/01/2015	486.739	58.538	545.277
	19/01/2015~18/02/2015	515.435	40.526	537.486
	19/02/2015~18/03/2015	478.535	26.615	505.150
	19/03/2015~18/04/2015	563.677	0.000	563.677
	19/04/2015~18/05/2015	431.186	59.973	491.159
	19/05/2015~18/06/2015	569.887	0.281	570.169
	19/06/2015~18/07/2015	490.240	39.683	493.084
	19/07/2015~18/08/2015	486.921	54.536	541.456
	19/08/2015~18/09/2015	495.705	54.002	531.280
	19/09/2015~18/10/2015	475.531	52.318	527.850
	19/10/2015~18/11/2015	507.281	42.531	532.585
	19/11/2015~18/12/2015	507.133	6.272	513.404

	19/12/2015~31/12/2015	177.497	35.064	212.561
	19/12/2014~31/12/2015	6,185.767	470.339	6,656.105
Means of verification	<p>The total amount of exported electricity out of project is measured automatically by certified 2 watt-hour meters and measured figures are automatically transferring to the KPX.</p> <p>The validation team checked whether the monitoring activities in relation to this parameter comply with the monitoring plan by physically inspecting the applied measuring device and related equipment for data generation, aggregation, recording and reporting. Furthermore, the KFQ verification team performed data crosscheck between the meter readings against monthly sales receipts provided by KPX.</p> <p>All results have been verified against the requirements out of monitoring plan and the applied methodology.</p> <p>Procedures and records on calibration, maintenance and QA/QC activities have been reviewed and checked against the requirements out of the monitoring plan and the applied methodology.</p>			
Findings	<p>There are two Watt-hour meter, Wa and Wc, as described in the revised PDD version 5. Wa measures generated electricity from 1st and 2nd generators, and Wc measures electricity generated by 2nd generator.</p> <p>Amount of electricity exported is automatically monitored by these two meters connected to Korea Power Exchange (KPX). Verification team checked meter reading (monthly data: it is aggregated data from daily and weekly reading) by these meters against monthly sales receipts provided by KPX.</p>			
Conclusion	It is confirmed that exported electricity out of the project is correctly monitored and correct value is applied in baseline emission calculation.			

Data/Parameter	EL_{IMP,PJT,Y}		
Data Unit	MWh		
Description	Total amount of imported electricity to meet project requirement		
Source of data used	Watt-hour meter		
Value(s)	Date	Measured EL _{IMP} (MWh)	
	19/12/2014~18/01/2015	0.336	
	19/01/2015~18/02/2015	0.096	
	19/02/2015~18/03/2015	0.096	
	19/03/2015~18/04/2015	0.144	
	19/04/2015~18/05/2015	0.216	
	19/05/2015~18/06/2015	0.096	
	19/06/2015~18/07/2015	0.408	
	19/07/2015~18/08/2015	0.264	
	19/08/2015~18/09/2015	0.144	

	19/09/2015~18/10/2015	0.048	
	19/10/2015~18/11/2015	0.120	
	19/11/2015~18/12/2015	0.024	
	19/12/2015~31/12/2015	0.096	
	19/12/2014~31/12/2015	2.088	
Means of verification	<p>The total amount of imported electricity from outside of the project site is measured automatically by a certified watt-hour meter.</p> <p>The validation team checked whether the monitoring activities in relation to this parameter comply with the monitoring plan by physically inspecting the applied measuring device and related equipment for data generation, aggregation, recording and reporting. Furthermore, the KFQ verification team performed data crosscheck between the amounts of imported electricity in the monitoring report against sales receipts provided by KEPCO.</p> <p>All results have been verified against the requirements out of monitoring plan and the applied methodology.</p> <p>Procedures and records on calibration, maintenance and QA/QC activities have been reviewed and checked against the requirements out of the monitoring plan and the applied methodology.</p>		
Findings	<p>The amount of imported electricity is measured automatically by certified watt-hour meter (W_b) and sales receipts for imported electricity are issued by KEPCO.</p> <p>The verification team checked the sales receipts from KEPCO on total amount of electricity imported from the Grid during this monitoring period against the value provide in the monitoring report. For the conservative estimation, imported electricity during 01/01/2016~18/01/2016 is included in 0.096MWh(for the period of 19/12/2015~31/12/2015) due to billing cycle of EL _{IMP,PJT,Y} is 1 month (i.e 19/12/2015~18/01/2016).</p>		
Conclusion	<p>It is confirmed that imported electricity from the Grid to the project activity is correctly monitored by well-calibrated measuring device and correct value is applied in baseline emission calculation.</p>		

E.6.3. Implementation of sampling plan

Means of verification	N/A
Findings	N/A
Conclusion	N/A

E.7. Compliance with the calibration frequency requirements for measuring instruments

General statement

Means of verification	The means of verification in relation to the specific instruments are stated in detail in the tables further below.
Findings	The findings in relation to the specific instruments are stated in detail in the tables further below.

Conclusion	KFQ confirms that the calibration of the measuring equipment has been conducted as per manufacturer's specifications, applied methodology and the monitoring plan. KFQ confirms, that there has not been any calibration delay for any instrument affecting the verification period and thus, there is no error to be applied on any monitored parameters.
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The table of the CDM-VCR-FORM has been used for the assessment, following rows as needed have been added: Data/Parameter, Data Unit, Description, TAG / Serial Number, Type, Accuracy level, Calibration entity, Calibration frequency, Previous calibration (when applicable), Latest calibration, Applied period of max. permissible error (when applicable). Some parameters involve several instruments, table rows have been added as needed accordingly.

Data/Parameter	LFG_{electricity, Y}		
Data Unit	Nm ³ /y		
Description	Amount of landfill gas combusted in power plant		
TAG Number/ Serial No.	<ul style="list-style-type: none"> F_a(Main flow meter): 906044B F_b(Flow meter for 1st generator): 812003 F_c(Flow meter for 2nd generator): 906044A 		
Type	Thermal Mass Flow Meter	Accuracy level	1%
Calibration Entity	Flow Technology Co., Ltd.	Calibration frequency	3 years
Previous calibration		F _a (Main flow meter)	F _b (Flow meter for 1 st generator):
			F _c (Flow meter for 2 nd generator):
	Date	02/04/2012~ 03/04/2012	02/04/2012~ 03/04/2012
	Validity	01/04/2015	01/04/2015
Latest calibration		F _a (Main flow meter)	F _b (Flow meter for 1 st generator):
			F _c (Flow meter for 2 nd generator):
	Date	31/03/2015~ 01/04/2015	31/03/2015~ 01/04/2015
	Validity	30/03/2018	30/03/2018
The applied period of max. permissible error when applicable	N/A(No calibration delay)		
Means of verification	The KFQ verification team has visually checked the physical existence of the instrument. The KFQ validation team has checked the calibration records & instrument history against the calibration requirements as per the applied methodology, the monitoring plan as well as the available instrument specifications including manufacturer recommended frequencies.		
Findings	According to the monitoring plan in the revised PDD, calibration frequency of gas flow meter is 3 years and accuracy level of these meters is 1%.		

	<p>Last calibration of 3 flow meters was performed during 31 March 2015 ~01 April 2015 thus previous and latest calibration result is valid to covers this 6th monitoring period.</p> <p>Verification team checked the latest calibration report and crosschecked the serial number of each meter in the calibration report against monitoring report and flow meters installed at the project site.</p>
Conclusion	The verification confirms that accuracy level and the calibration interval of the monitoring equipment are controlled and calibrated in accordance with the revised monitoring plan and applied methodology. And 3 flow meters were valid to measure the amount of landfill gas combusted in power plant during this monitoring period.

Data/Parameter	W _{CH4,y}						
Data Unit	%						
Description	Methane fraction in LFG						
TAG/ Serial No.	A8M7282T						
Type	Infrared gas analyzer	Accuracy level	· Linearity: 1% · Repeatability: 0.5%				
Calibration Entity	National Metrology Institute	Calibration frequency	3 years				
Previous calibration	<table><tr><td>Date</td><td>02/04/2012</td></tr><tr><td>Validity</td><td>01/04/2015</td></tr></table>			Date	02/04/2012	Validity	01/04/2015
Date	02/04/2012						
Validity	01/04/2015						
Latest calibration	<table><tr><td>Date</td><td>26/03/2015</td></tr><tr><td>Validity</td><td>25/03/2018</td></tr></table>			Date	26/03/2015	Validity	25/03/2018
Date	26/03/2015						
Validity	25/03/2018						
The applied period of max. permissible error when applicable	N/A(No calibration delay)						
Means of verification	The KFQ verification team has visually checked the physical existence of the instrument. The KFQ validation team has checked the calibration records & instrument history against the calibration requirements as per the applied methodology, the monitoring plan as well as the available instrument specifications including manufacturer recommended frequencies.						
Findings	<p>According to the monitoring plan in the revised PDD, calibration frequency of gas analyzer is 3 years, and accuracy level of linearity and repeatability is 1% and 0.5% respectively.</p> <p>Last calibration was performed on 26 March 2015 thus previous and latest calibration result is valid to covers this 6th monitoring period.</p> <p>Verification team checked the latest calibration report and crosschecked the serial number of gas analyzer in the calibration report against monitoring report and flow meters installed at the project site.</p>						
Conclusion	The verification confirms that accuracy level and the calibration interval of the monitoring equipment are controlled and calibrated in accordance with the revised monitoring plan and applied methodology. The gas analyzer was valid to use in calculation of weighted-average of methane fraction as well as baseline emission						

calculation during this monitoring period.
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Data/Parameter	EL_{EXP, PJT, Y}											
Data Unit	MWh											
Description	Total amount of exported electricity out of the project											
TAG/ Serial No.	<ul style="list-style-type: none"> W_a(Measuring exported electricity by 1st and 2nd generator): 95246742 W_c(Measuring exported electricity by 2nd generator): 50339836 											
Type	Watt-hour meter	Accuracy level	0.5s									
Calibration Entity	Korea Testing Certification (KTC)	Calibration frequency	At least once in 2 years									
Previous calibration	<table border="1"> <thead> <tr> <th></th> <th>W_a</th> <th>W_c</th> </tr> </thead> <tbody> <tr> <td>Date</td> <td>20/08/2012~23/08/2012</td> <td>04/01/2013~09/01/2013</td> </tr> <tr> <td>Validity</td> <td>19/08/2014</td> <td>03/01/2015</td> </tr> </tbody> </table>				W _a	W _c	Date	20/08/2012~23/08/2012	04/01/2013~09/01/2013	Validity	19/08/2014	03/01/2015
	W _a	W _c										
Date	20/08/2012~23/08/2012	04/01/2013~09/01/2013										
Validity	19/08/2014	03/01/2015										
Latest calibration	<table border="1"> <thead> <tr> <th></th> <th>W_a</th> <th>W_c</th> </tr> </thead> <tbody> <tr> <td>Date</td> <td>20/08/2014~26/08/2014</td> <td>20/08/2014~26/08/2014</td> </tr> <tr> <td>Validity</td> <td>19/08/2016</td> <td>19/08/2016</td> </tr> </tbody> </table>				W _a	W _c	Date	20/08/2014~26/08/2014	20/08/2014~26/08/2014	Validity	19/08/2016	19/08/2016
	W _a	W _c										
Date	20/08/2014~26/08/2014	20/08/2014~26/08/2014										
Validity	19/08/2016	19/08/2016										
The applied period of max. permissible error when applicable	N/A(No calibration delay)											
Means of verification	The KFQ verification team has visually checked the physical existence of the instrument. The KFQ validation team has checked the calibration records & instrument history against the calibration requirements as per the applied methodology, the monitoring plan as well as the available instrument specifications including manufacturer recommended frequencies.											
Findings	<p>According to the monitoring plan in the revised PDD, calibration shall be performed at least once in 2 years and accuracy level is 0.5s.</p> <p>For the W_a, previous calibration was performed during 20 August 2012 ~23 August 2012 and it was valid until 19 August 2014. Thus calibration of this meter was performed during 20 August 2014~26 August 2014 and it is valid until 19 August 2016 which is within this monitoring period.</p> <p>In case of W_c, it was calibrated during 20 August 2014 ~ 26 August 2014 and it is valid until 19 August 2016. Thus calibration of W_c, was not performed during this monitoring period.</p> <p>Verification team checked the previous and latest calibration report and crosschecked the serial number of Watt-hour meters (W_a and W_c) in the calibration report against monitoring report and meters installed at the project site.</p> <p>[CL 2] In the monitoring report, serial number of W_a is described as 9524642 which is not correct information against the revised PDD and site observation. PP shall confirm correct serial number of watt-hour meter to measure exported electricity by 1st and 2nd generator.</p>											
Conclusion	According to the previous and latest calibration report, verification team could confirm that accuracy level and calibration interval is well controlled according to the monitoring plan by PP. Also Watt-hour meters were valid to monitor electricity											

	<p>exported during this monitoring period. Therefore, value used in baseline emission calculation is valid.</p> <p>Regarding to the CL2, verification team confirmed that PP revised monitoring report to provide correct serial number of Wa, 95246742, and it was crosschecked with revised PDD, previous monitoring report and its verification report, calibration report to confirm it.</p>
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Data/Parameter	EL _{IMP,PJT,y}		
Data Unit	MWh		
Description	Total amount of imported electricity to meet project requirement		
TAG/ Serial No.	0190662/24142000332		
Type	Watt-hour meter	Accuracy level	1s/0.5s
Calibration Entity	Korea Testing Certification (KTC)	Calibration frequency	Once in 2 years
Previous calibration	S/N	0190662	
	Date	26/09/2011~27/09/2011	
	Validity	26/09/2013	
Latest calibration	S/N	0190662	
	Date	24/09/2013~25/09/2013	
	Validity	23/09/2015	
	S/N	24142000332	
	Date	17/06/2014	
	Validity	16/06/2016	
	Comments	It was replaced watt-hour meter of 0190662 according to national law and measured imported electricity by this meter was used in estimation of emission reduction from 14/04/2015,	
The applied period of max. permissible error when applicable	N/A(No calibration delay)		
Means of verification	The KFQ verification team has visually checked the physical existence of the instrument. The KFQ validation team has checked the calibration records & instrument history against the calibration requirements as per the applied methodology, the monitoring plan as well as the available instrument specifications including manufacturer recommended frequencies.		
Findings	To measure imported electricity to the project activity, Watt-hour meter of 0190662 was used and calibration was completed on 25 September 2013. Even it is valid up to 23 September 2015, this meter was replaced to Watt-hour meter of 24142000332 according to the ‘Enforcement Decree of the Measures Act’ on 14/04/2015. Since 14/04/2015, Watt-hour meter of 24142000332 was used as measuring device to monitor imported electricity and Watt-hour meter of 0190662 was used up-to 14/04/2015. Regarding to the calibration, both meters are calibrated on 24/09/2013 and 17/06/2014 respectively thus these are valid to measure imported electricity to the project activity for this monitoring period. Verification team checked the previous and		

	latest calibration report and crosschecked the serial number of Watt-hour meters in the calibration report against monitoring report and meters installed at the project site.
Conclusion	The verification confirms that accuracy level and the calibration interval of the monitoring equipment are controlled and calibrated in accordance with the revised monitoring plan and applied methodology. The Watt-hour meter W_a and W_b were valid to use to monitor imported electricity from the Grid as well as baseline emission calculation during this monitoring period.

E.8. Assessment of data and calculation of emission reductions or net removals

E.8.1. Calculation of baseline GHG emissions or baseline net GHG removals by sinks

Means of verification	<p>KFQ has reviewed all data, parameters and calculations with respect to calculation of the baseline GHG emissions and checked them against the requirements out of the applied methodology AMS.I.D (Version 13) and AMS III.G(Version 06) as well as relevant tools applied.</p> <p>KFQ has also assessed the completeness, quality and appropriateness of the data, parameters and calculations. Furthermore, KFQ has assessed, whether any assumptions, emission factors, default values, GWPs or other reference values – as applicable – used by the PPs have been justified and correctly applied, in line with the requirements. KFQ has further crosschecked – as applicable - any information with other sources available, such as but not limited to production log sheets, meters available in the operators control room or on-site, etc.</p>
Findings	<p>The baseline GHG emissions have been found to be 52,031.387 tCO₂e for the verification period. It was found that a complete set of data covering the monitoring period has been provided by the PPs. Activity levels and non-activity parameters have been monitored in accordance with the monitoring plan, as applicable. The calculation was found to be correct as well as carried out in accordance with the formulae and methods described in the monitoring methodology AMS I.D(version 13), AMS III.G(version 06) and the revised PDD (version 05, 29 November 2013).</p> <p>It was found that all emission factors, GWPs and default values and reference values, as applicable, have been correctly justified, are explicitly mentioned in the monitoring report and have been correctly applied. It was found that no assumptions are used that have any relevant influence on reported emission reductions.</p> <p>It was found that the spreadsheets, including corresponding re-calculations of data during events as described in the monitoring report, were made available completely by the PP and that all formulae have been correctly implemented and are accessible and traceable. Any recalculations are in line with the procedure in the revised PDD and have been checked and found to be correct and conservative. Safeguarding procedures in accordance to the monitoring plan have been applied in a conservative way. Rounding of digits, where applicable, has been applied both correctly and conservatively.</p> <p>All necessary documentation is collected, referenced and aggregated and is easily accessible in spreadsheets and daily reports in electronic format. Measurements are performed by calibrated equipment, and key data could be cross-checked via</p>

	<p>other sources (if applicable), such as raw data generated in the data server, production log sheets and meters available in the operators control room or on-site. Further details on cross-checks for each parameter and the information flow are given in sections E.6.2 above.</p> <p>A detailed assessment of all relevant parameters for the verification period is given in E.6.1 and E.6.2 above.</p> <table><tr><th>Parameter</th><th>Formula</th><th>Value</th></tr><tr><td>BE_y</td><td>= (MD_y - MD_{reg,y}) + EL_{EXP,PJT,y} x CEF</td><td>52,031.387 tCO_{2e}</td></tr><tr><td>MD_y</td><td>= LFG_{electricity, y} x W_{CH4,y} X D_{CH4,y} x GWP_{CH4}</td><td>4,859,551.671 tCO_{2e}</td></tr><tr><td>MD_{reg,y}</td><td></td><td>0</td></tr><tr><td>EL_{EXP,PJT,y}</td><td></td><td>6,656.105 MWh</td></tr><tr><td>CEF</td><td></td><td>0.5375 tCO₂/MWh</td></tr><tr><td>LFG_{electricity, y}</td><td></td><td>4,887,513 Nm³</td></tr><tr><td>W_{CH4,y}</td><td></td><td>55.48%</td></tr><tr><td>D_{CH4,y}</td><td></td><td>0.0007168 t/Nm³</td></tr><tr><td>GWP_{CH4}</td><td></td><td>25</td></tr></table>	Parameter	Formula	Value	BE _y	= (MD _y - MD _{reg,y}) + EL _{EXP,PJT,y} x CEF	52,031.387 tCO _{2e}	MD _y	= LFG _{electricity, y} x W _{CH4,y} X D _{CH4,y} x GWP _{CH4}	4,859,551.671 tCO _{2e}	MD _{reg,y}		0	EL _{EXP,PJT,y}		6,656.105 MWh	CEF		0.5375 tCO ₂ /MWh	LFG _{electricity, y}		4,887,513 Nm ³	W _{CH4,y}		55.48%	D _{CH4,y}		0.0007168 t/Nm ³	GWP _{CH4}		25
Parameter	Formula	Value																													
BE _y	= (MD _y - MD _{reg,y}) + EL _{EXP,PJT,y} x CEF	52,031.387 tCO _{2e}																													
MD _y	= LFG _{electricity, y} x W _{CH4,y} X D _{CH4,y} x GWP _{CH4}	4,859,551.671 tCO _{2e}																													
MD _{reg,y}		0																													
EL _{EXP,PJT,y}		6,656.105 MWh																													
CEF		0.5375 tCO ₂ /MWh																													
LFG _{electricity, y}		4,887,513 Nm ³																													
W _{CH4,y}		55.48%																													
D _{CH4,y}		0.0007168 t/Nm ³																													
GWP _{CH4}		25																													
Conclusion	<p>KFQ confirms that all required data for calculation of the baseline GHG emissions were available for the whole verification period and no data were missing due to any non-monitoring of activity levels or non-activity parameters. KFQ confirms that suitable cross-checking of data was possible and has been performed as described.</p> <p>KFQ confirms that the PPs have followed appropriate methods and formulae for calculating baseline GHG emissions have been followed. KFQ confirms that any emission factors, GWPs and default values and reference values– as applicable – that were applied in the calculation have been justified and correctly applied. No assumptions were used. KFQ confirms that the calculation of the baseline GHG emissions for the covered monitoring period is fully complete and based on suitable and verifiable evidence.</p>																														

E.8.2. Calculation of project GHG emissions or actual net GHG removals by sinks

Means of verification	<p>KFQ has reviewed all data, parameters and calculations with respect to calculation of the project GHG emissions and checked them against the requirements out of the applied methodology AMS I.D (Version 13), AMS III.G (Version 06) and the revised PDD (Version 05, 29 November 2013) as well as relevant tools applied. KFQ has also assessed the completeness, quality and appropriateness of the data, parameters and calculations. Furthermore, KFQ has assessed, whether any assumptions, emission factors, default values, GWPs or other reference values – as applicable – used by the PPs have been justified and correctly applied, in line with the requirements. KFQ has further crosschecked – as applicable - any information with other sources available, such as but not limited to production log sheets, meters available in the operators control room or on-site, etc.</p>
Findings	<p>The baseline GHG emissions have been found to be 52,031.387 tCO_{2e} for the verification period. It was found that a complete set of data covering the monitoring period has been provided by the PPs. Activity levels and non-activity parameters have been monitored in accordance with the monitoring plan, as applicable. The calculation was found to be correct as well as carried out in accordance with the formulae and methods described in the monitoring methodology AMS I.D(version</p>

	<p>13), AMS III.G(version 06) and the revised PDD (Version 05, 29 November 2013).</p> <p>It was found that all emission factors, GWPs and default values and reference values, as applicable, have been correctly justified, are explicitly mentioned in the monitoring report and have been correctly applied. It was found that no assumptions are used that have any relevant influence on reported emission reductions.</p> <p>It was found that the spreadsheets, including corresponding re-calculations of data during events as described in the monitoring report, were made available completely by the PP and that all formulae have been correctly implemented and are accessible and traceable. Any recalculations are in line with the procedure in the revised PDD and have been checked and found to be correct and conservative. Safeguarding procedures in accordance to the monitoring plan have been applied in a conservative way. Rounding of digits, where applicable, has been applied both correctly and conservatively.</p> <p>All necessary documentation is collected, referenced and aggregated and is easily accessible in spreadsheets and daily reports in electronic format. Measurements are performed by calibrated equipment, and key data could be cross-checked via other sources (if applicable), such as raw data generated in the data server, production log sheets and meters available in the operators control room or on-site. Further details on cross-checks for each parameter and the information flow are given in sections E.6.2 above.</p> <p>A detailed assessment of all relevant parameters for the verification period is given in E.6.1 and E.6.2 above.</p> <table><tr><th>Parameter</th><th>Formula</th><th>Value</th></tr><tr><td>PE_y</td><td>= EL_{IMP,PJT,y} X CEF</td><td>1.122 tCO_{2e}</td></tr><tr><td>EL_{EXP,PJT,y}</td><td></td><td>2.088 MWh</td></tr><tr><td>CEF</td><td></td><td>0.5375 tCO₂/MWh</td></tr></table>	Parameter	Formula	Value	PE _y	= EL _{IMP,PJT,y} X CEF	1.122 tCO _{2e}	EL _{EXP,PJT,y}		2.088 MWh	CEF		0.5375 tCO ₂ /MWh
Parameter	Formula	Value											
PE _y	= EL _{IMP,PJT,y} X CEF	1.122 tCO _{2e}											
EL _{EXP,PJT,y}		2.088 MWh											
CEF		0.5375 tCO ₂ /MWh											
Conclusion	<p>KFQ confirms that all required data for calculation of the baseline GHG emissions were available for the whole verification period and no data were missing due to any non-monitoring of activity levels or non-activity parameters. KFQ confirms that suitable cross-checking of data was possible and has been performed as described.</p> <p>KFQ confirms that the PPs have followed appropriate methods and formulae for calculating baseline GHG emissions have been followed. KFQ confirms that any emission factors, GWPs and default values and reference values– as applicable – that were applied in the calculation have been justified and correctly applied. No assumptions were used. KFQ confirms that the calculation of the baseline GHG emissions for the covered monitoring period is fully complete and based on suitable and verifiable evidence.</p>												

E.8.3. Calculation of leakage GHG emissions

Means of verification	KFQ has checked, whether leakage emissions (if any) were determined by the PPs in accordance with the applied methodology, the PDD and the monitoring plan.
Findings	KFQ has found that the approach applied by the PPs that leakage emissions need not to be considered (i.e. being considered zero, consequently) is in accordance to the applied methodology AMS I.D (Version 13) and AMS III.G (Version 06).
Conclusion	KFQ confirms that the PPs approach with regard to leakage GHG emissions is

	correct and that no leakage GHG emissions need to be considered in the project based on the applied methodology.
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E.8.4. Summary of calculation of GHG emission reductions or net anthropogenic GHG removals by sinks

Means of verification	<p>KFQ has reviewed all data, parameters and calculations with respect to calculation of the GHG emission reductions and checked them against the requirements out of the applied methodology AMS I.D(version 13), AMS III.G(version 06) and the revised PDD (Version 05, 29 November 2013) as well as relevant tools applied.</p> <p>KFQ has also assessed the completeness, quality and appropriateness of the data, parameters and calculations.</p> <p>Furthermore, KFQ has assessed, whether any assumptions, emission factors, default values, GWPs or other reference values – as applicable – used by the PPs have been justified and correctly applied, in line with the requirements.</p> <p>KFQ has further crosschecked – as applicable - any information with other sources available, such as but not limited to production log sheets, meters available in the operators control room or on-site, etc.</p> <p>Means of verification in respect of baseline GHG emissions, project GHG emissions and leakage GHG emissions, that form the basis for calculation of the GHG emission reductions, are stated in detail in sections E.8.1., E.8.2. and E.8.3. above.</p>
Findings	<p>The GHG emission reductions have been found to be 52,030 tCO₂e for the verification period. It was found that the first day in which CERs are being claimed in this verification period has been correctly specified by the PPs, being 19/12/2014.</p> <p>It was found that a complete set of data covering the monitoring period has been provided by the PPs. Activity levels and non-activity parameters have been monitored in accordance with the monitoring plan, as applicable.</p> <p>The calculation was found to be correct as well as carried out in accordance with the formulae and methods described in the monitoring methodology AMS I.D(version 13), AMS III.G(version 06) and the PDD (Version 05, dated on 29 November 2013) as well as relevant tools applied.</p> <p>It was found that all emission factors, GWPs and default values and reference values, as applicable, have been correctly justified, are explicitly mentioned in the monitoring report and have been correctly applied. It was found that no assumptions are used that have any relevant influence on reported emission reductions. It was found that all parameters are automatically collected by the data server. It was found that there is no uncertainty related to manual transfer of data used in the calculation of emission reduction since the monitored parameters are automatically collected. All actions performed at the computer station are logged and the log file is available for KFQ. It was found that the spreadsheets, including corresponding recalculations of data during events as described in the monitoring report, were made available completely by the PP and that all formulae have been correctly implemented and are accessible and traceable. Any recalculations are in line with the procedure in the revised PDD and have been checked and found to be correct and conservative. Safeguarding procedures in accordance to the monitoring plan have been applied in a conservative way. Rounding of digits, where applicable, has</p>

	<p>been applied both correctly and conservatively. All necessary documentation is collected, referenced and aggregated and is easily accessible in spreadsheets and daily reports in electronic format. Measurements are performed by calibrated equipment, and key data could be cross-checked via other sources (if applicable), such as raw data generated in the data server, production log sheets and meters available in the operators control room or on-site. Further details on cross-checks for each parameter and the information flow are given in sections E.6.2 above.</p> <p>A detailed assessment of all relevant parameters for the verification period is given in E.6.1 and E.6.2 above. Findings in respect of baseline GHG emissions, project GHG emissions and leakage GHG emissions, that form the basis for calculation of the GHG emission reductions, are stated in detail in sections E.8.1., E.8.2. and E.8.3. above.</p>
Conclusion	<p>KFQ confirms that all required data for calculation of the calculation of GHG emission reductions were available for the whole verification period and no data were missing due to any non-monitoring of activity levels or non-activity parameters.</p> <p>KFQ confirms that suitable cross-checking of data was possible and has been performed as described.</p> <p>KFQ confirms that the PPs have followed appropriate methods and formulae for calculating GHG emission reductions have been followed.</p> <p>KFQ confirms that any emission factors, GWPs and default values and reference values– as applicable – that were applied in the calculation have been justified and correctly applied. No assumptions were used.</p> <p>KFQ confirms that the calculation of the baseline GHG emissions for the covered monitoring period is fully complete and based on suitable and verifiable evidence.</p> <p>KFQ finally confirms, that the amount of emission reductions claimed by the PPs for the verification period from 19/12/2014 to 31/12/2015, amounting to 52,030 tCO_{2e}, is correctly determined and calculated.</p>

E.8.5. Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Means of verification	KFQ compared the ex-ante estimation of emission reductions in the registered PDD with the emission reductions reported by the PPs in the monitoring report.
Findings	<p>KFQ found that the emission reductions in the PDD were estimated as 27,348 tonnes of CO₂ equivalents during the 378 days of the monitoring period. The emission reductions reported by the PPs during the same period were 52,030 tCO_{2e}.</p> <p>It was found, that the PPs have correctly described the situation in the monitoring report as well.</p>
Conclusion	KFQ confirms that the reported emission reductions in the monitoring report (v2) is higher than estimated in the PDD. KFQ confirms that the emission reductions claimed by the PPs are reasonable.

E.8.6. Remarks on difference from estimated value in registered PDD

Means of verification	As determined in section E.8.5 above, the emission reductions of the project activity during the verification period are slightly higher than emissions reductions estimated ex-ante in the PDD, KFQ has checked the respective explanation offered by the PPs in the monitoring period.
Findings	<p>The reported emission reductions in the monitoring report during 6th monitoring period is approximately 90% higher than the ex-ante estimation in the PDD, and reason of this increasing is could be explained as below.</p> <ul style="list-style-type: none"> • <u>Updated value of GWPCH₄</u> : According to the decision made at COP 17, new GWP for methane, 25 from 21 is applied for this monitoring period. . • <u>Applied conservative data to estimate annual emission reduction in the PDD</u> : While estimate annual emission reduction in the PDD, methane emission potential of a solid waste disposal site ($BE_{CH_4,SWDS,y}$) was used in baseline emission calculation. Thus expected amount of LFG may differ from actual LFG generated at the project site. For this monitoring period average flow rate was 8.82 m³/min whereas it was 6.35 m³/min in revised PDD. • <u>Waste quantity</u> : Mokpo landfill site is still receiving waste and actual received waste until December 2015 is larger than expected amount of waste in the revised PDD even though waste received during this monitoring period is smaller than expected. Thus it may cause increasing methane contents in the LFG by its first decay. • <u>Concentration of methane</u> : W_{CH_4} for this monitoring period is 55.48% whereas 50% was applied to estimate annual emission reduction in the PDD. <p>Meanwhile, amount of actual generated electricity (6,656 MWh) for this monitoring period is slightly smaller than it's expectation in the revised PDD (6,685 MWh). 6685 MWh was estimated simply by considering only capacity of generator and expected operating hour. Thus it is not comparable one-on-one. In a point of additionality, increasing of amount of LFG is not a factor to influence income of the project activity as exported electricity is the only factor for revenue. Due to decreasing of electricity exporting to the Grid, there is no issue to be considered for additionality of this project activity.</p>
Conclusion	<p>The reasons for increase of actual emission reductions the ex-ante estimation in the monitoring report is valid as well as this increasing does not influence on the additionality of this project activity itself.</p> <p>Thus, KFQ confirms that the explanation for the emission reductions of the project activity during the verification period is reasonable and that there are no non-conservative aspects associated with it.</p>

E.8.7. Actual GHG emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Means of verification	The GHG emission reductions reported in the monitoring report are 52,030 tCO _{2e} . As described in detail in Section E of this report, all relevant aspects of the project activity have been assessed in order to determine, whether the claimed emission reductions by the PPs are correctly determined, reasonable and fairly stated and based on verifiable evidence and in accordance with the applied methodology and
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	the registered PDD as well as applicable tools. The reported emission reductions in the MR in the monitoring period are 52,030 tonnes of CO ₂ equivalents.
Findings	It was found that the project activity is implemented and operated according to the revised PDD and the monitoring of any and all data and parameters as well as calculation of baseline GHG emissions, project GHG emissions and GHG emission reductions is complete conducted in accordance with the revised PDD, the applied methodology.
Conclusion	KFQ arrived at the conclusion that the GHG emission reductions reported in the monitoring report and claimed by the PPs are correctly determined with 52,030 tCO _{2e} for the covered verification period between 19/12/2014 and 31/12/2015. This implies that 100% of the reported GHG emission reduction in this verification period has been achieved in a period after the end of 31/12/2012, i.e. the first commitment period is untouched by this verification period.

SECTION F. Internal quality control

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According to KFQ's Procedure for deciding whether to proceed request for issuance, the final verification report and verification findings was underwent a technical review before being submitted to the project participants for requesting issuance CERs. The technical review was performed by technical review team composed of a person qualified in accordance with KFQ's qualification scheme for CDM project validation and verification.

SECTION G. Verification opinion

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Through the verification for the monitoring report of the CDM project: 'Mokpo Landfill Gas Recovery Project for Electricity Generation' in accordance with VVS(version 9.0), KFQ could confirm that:

- The project activity has been implemented and operated as per the revised PDD (Version 5, 29 November 2013) accepted by the CDM EB on 06 March 2014.
- The installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately.
- The monitoring plan in Monitoring Report is as per the monitoring plan in the revised PDD.
- Monitoring plan in the revised PDD is as per the applied methodology,
- The monitoring systems and procedures comply with the monitoring systems and procedures described in the revised and accepted monitoring plan, and approved methodology including applicable tool(s) and generated GHG emission reductions data.
- The GHG emission reductions in the Monitoring Report (Version 2.0) are calculated without material misstatements

KFQ's verification opinion refers to the project's GHG emissions and resulting GHG emission

reductions reported both determined due to the valid and registered project's baseline, its monitoring plan and its associated documents.

Based on the information we have seen and evaluated, we confirm the followings:

Project Title	Mokpo Landfill Gas Recovery Project for Electricity Generation
UNFCCC Reference Number	2834
Date of registration	18 February 2010
Revised PDD	29 November 2013 (Version 05, approved on 06/03/2014)
Methodology applied	AMS I.D (Version 13) AMS III.G (Version 06)
Final version of Monitoring Report	2.0 (20 April 2016)
Crediting period	18/02/2010 to 17/02/2020
Monitoring period	19/12/2014 to 31/12/2015
Total GHG emission Reductions Verified	Baseline emissions: 52,031 tonnes CO _{2e} Project emissions: 1 tonnes CO _{2e} Leakage: 0 tonnes CO _{2e} Emission reductions: <u>52,030 tonnes CO_{2e}</u>

It is the opinion of KFQ that the amount of GHG emission reductions achieved by the project activity during this monitoring period is correct and that it complies with all applicable CDM requirements.

SECTION H. Certification statement

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Korean Foundation for Quality has performed the periodic verification of the emission reductions that have been reported for the CDM project: 'Mokpo Landfill Gas Recovery Project for Electricity Generation' (UNFCCC Registration Ref. No. 2834) for the period from 19 December 2014 to 31 December 2015.

The project participants are responsible for the collection of data in accordance with the revised PDD and the reporting of GHG emissions reductions from the project. It is KFQ's responsibility to express an independent verification statement on the reported GHG emission reductions from the project.

KFQ conducted the verification on the basis of the monitoring methodologies, AMS I.D (version 13) and AMS III.G (version 06), the revised Project Design Document of 29 November 2013 (version 05), the validation report (dated 17 February 2010) and the monitoring report (version 2) dated 20 April 2016.

KFQ's verification approach draws on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. KFQ planned and performed the verification by obtaining evidence and other information and explanations that KFQ considers necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

In our opinion the GHG emissions reductions of the 'Mokpo Landfill Gas Recovery Project for Electricity Generation' (UNFCCC Registration Ref. No. 2834) for the period 19 December 2014 to 31 December 2015 are fairly stated in the monitoring report (version 2.0).

The data generation, aggregation, recording, calculation and reporting of GHG emission reductions were correctly conducted on the basis of the approved baseline and monitoring methodologies, AMS I.D (version 13) and AMS III.G (version 06), and the revised Project Design Document of 29 November 2013 (version 05) accepted by CDM EB on 06 March 2014.

Hence, KFQ is able to certify that the emission reductions from the 'Mokpo Landfill Gas Recovery Project for Electricity Generation' during the period from 19 December 2014 to 31 December 2015 is 52,030 tonnes of CO₂ equivalent.

Signed on behalf of the Korean Foundation for Quality

Signature :



Name : Soon Hong YEOM, Managing Director

Date : 12 May 2016

Appendix 1. Abbreviations

Abbreviations	Full texts
AMS	Approved Small Scale Methodology
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction(s)
CL	Clarification Request
CMP	COP/MOP Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
	Carbon dioxide
CO ₂	Carbon dioxide equivalent
CO _{2e}	Distributive Control System
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
KEPCO	Korea Electric Power Corporation
KFQ	Korean Foundation for Quality
KPX	Korea Power Exchange
LFG	Landfill Gas
MR	Monitoring Report
PDD	Project Design Document
PP	Project participant
PS	Clean Development Mechanism Project Standard
SWDS	Solid Waste Disposal Site
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Clean Development Mechanism Validation and Verification Standard

Appendix 2. Competence of team members and technical reviewers



CERTIFICATE OF COMPETENCE

Name: Mi Jung LEE

Qualification:

-Lead auditor

Validation



Verification



-Auditor



-Technical Expert



-Local Expert



Scopes of Expertise:

Technical Area (TA)

1.2 Renewables

3.1 Energy demand

13.1 Solid waste and wastewater

13.2 Manure

She is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 31 March 2016.

Sustainability Management Institute

Sang Yeon PARK



CERTIFICATE OF COMPETENCE

Name: Sung Han YOON

Qualification:

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

Scopes of Expertise:

Technical Area (TA)

- 1.1 Thermal energy generation
- 1.2 Renewables
- 5.1 Chemical Industry
- 5.2 Caprolactam, nitric and adipic acid
- 11.1 Emissions of fluorinated gases
- 13.1 Solid waste and wastewater
- 13.2 Manure

He is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 31 March 2016.

Sustainability Management Institute
Sang Yeon PARK

A handwritten signature in black ink, consisting of a stylized 'S' followed by a series of loops and a horizontal line.

CERTIFICATE OF COMPETENCE

Name: Jin Seok CHO

Qualification:

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

Scopes of Expertise:

Technical Area (TA)

- 1.2 Renewables
- 13.1 Solid waste and wastewater
- 13.2 Manure
- 1.1 Thermal energy generatio

He is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 31 March 2016.

Sustainability Management Institute
Sang Yeon PARK



CERTIFICATE OF COMPETENCE

Name: Sang Yeon PARK

Qualification:

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

Scopes of Expertise:

Technical Area (TA)

- 1.2 Renewables
- 3.1 Energy demand
- 5.2 Caprolactam, nitric and adipic acid
- 13.1 Solid waste and wastewater

She is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 31 March 2016.

Sustainability Management Institute
Yu Shim JEONG



Appendix 3. Documents reviewed or referenced

No	Author	Title	References to the document	Provider
1	Project participants	Monitoring report : 6 th monrep_2834_v1_Clean 6 th monrep_2834_v2_Clean 6 th monrep_2834_v2_Track	16 March 2016 20 April 2016	Hanwha Corporation
2	Project participants	ER calculation spreadsheet : Mokpo_6 th MR_2834_Emission Reduction_v1.0 Mokpo_6 th MR_2834_Emission Reduction_v2.0	16 March 2016 20 April 2016	Hanwha Corporation
3	Project participants	CDM Project Design Document : Mokpo Landfill Gas Recovery Project for Electricity Generation, Version 05	http://cdm.unfccc.int/Projects/DB/emc1249265030.9/view	UNFCCC Website
4	Environmental Management Corporation (EMC)	Validation report for 'Mokpo Landfill Gas Recovery Project for Electricity Generation' (Report No. 08-001, Revision No. 08 dated as 17 February 2010)	http://cdm.unfccc.int/Projects/DB/emc1249265030.9/view	UNFCCC Website
5	Korean Foundation for Quality(KFQ)	Previous verification/certification report for 'Mokpo Landfill Gas Recovery Project for Electricity Generation (Version 01.01)	http://cdm.unfccc.int/Projects/DB/emc1249265030.9/view	UNFCCC Website
6	Data server	Spreadsheet of daily raw data downloaded from the data server: flow rate, methane fraction	from 19/12/2014 to 31/12/2015	Hanwha Corporation
7	Data server/ Hanwha Corporation	Event log files and daily work log recorded manually Spreadsheet_Comparison of No. of events	from 19/12/2014 to 31/12/2015 20/04/2016	Hanwha Corporation
8	Hanwha Corporation	Monthly report of waste volume in Mokpo Landfill site	from 19/12/2014 to 31/12/2015	Hanwha Corporation
9	Hanwha Corporation	Operating manual –Mokpo LFG Power Plant (Version 16)	15 April 2015	Hanwha Corporation
10	Hanwha Corporation/ KPX	Daily, weekly, monthly record for electricity export and sales receipt of it	from 19/12/2014 to 31/12/2015	Hanwha Corporation
11	KEPCO	Monthly bill for electricity imported	from 19/12/2014 to 31/12/2015	Hanwha Corporation
12	Flow Technology Co., Ltd. / National Metrology Institute/Korea Testing	Calibration report: - $F_a/F_b/F_c$ - gas analyzer - Watt-hour meter (W_a/W_c) - Watt-hour meter (W_b)	from 19/12/2014 to 31/12/2015	Hanwha Corporation

	Certification/Korea Testing Certification			
13	Hanwha Corporation	Internal audit records External audit records Management review reports	2014 and 2015	Hanwha Corporation
14	CDM Executive Board	<ul style="list-style-type: none"> • Clean Development Mechanism Validation and Verification Standard, version 09.0. • Clean Development Mechanism Project Standard, version 09.0. • Sampling and surveys for CDM project activity and programme of activities, version 04.1 • Clean Development Mechanism Project Cycle Procedure, version 09.0. • AMS I.D: Grid connected renewable electricity generation (version 13) • AMS III.G: Landfill methane recovery (version 06) • Standard for application of the global warming potentials to clean development mechanism project activities and programme of activities for the second commitment period of the Kyoto Protocol, version 01.0 • Guideline on the application of materiality in verifications , version 02.0 • Request for issuance and post registration changes: Completeness Checklist, version 03.0 • Monitoring report form, version 05.1 • Verification and certification report form for CDM project activities, version 010.0 	20 February 2015 20 February 2015 28 November 2013 20 February 2015 28 May 2010 14 March 2008 13 September 2012 20 February 2015 27 March 2015 04 May 2015 23 March 2015	https://cdm.unfccc.int/

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. Remaining FAR from validation and/or previous verification

Not applicable

FAR ID	Section no.	Date:
Description of FAR		
Project participant response		Date:
Documentation provided by project participant		
DOE assessment		Date:

Table 2. CL from this verification

CL ID	Section no.	Date:
01	E.7	07/04/2016
Description of CL		
In the monitoring report, serial number of Wa is described as 9524642 which is not correct information against the revised PDD and site observation. PP shall confirm correct serial number of watt-hour meter to measure exported electricity by 1 st and 2 nd generator.		
Project participant response		Date:
PP revised monitoring report with correct serial number of Wa and provided calibration report of it to confirm serial number.		
Documentation provided by project participant		
Monitoring Report version 2.0 (20/04/2016)_Clean version Monitoring Report version 2.0(20/04/2016)_Track version Calibration report of Wa conducted on 20/08/2012 and 20/08/2014		
DOE assessment		Date:
Verification team confirmed that PP revised monitoring report to provide correct serial number of Wa, 95246742, and it was crosschecked with revised PDD, previous monitoring report and its verification report, calibration report to confirm it.		

Table 3. CAR from this verification

CAR ID	Section no.	Date:
01	E.6	07/04/2016
Description of CAR		

From 25 th March 2015 to 27 th March 2015, calibration of the gas analyser was conducted thus measured methane concentration shall be excluded in calculation of weighted average methane concentration for this monitoring period due to methane concentration within this period is measured under unstable status.	
Project participant response	Date: 20/04/2016
PP excluded methane concentration measured within above period to calculated $W_{CH_4,y}$ and previous $W_{CH_4,y}$ was became 55.48%. Estimation of emission reduction for this monitoring period is re-calculated with 55.48% of $W_{CH_4,y}$ evidence of it was provided to the verification team by PP.	
Documentation provided by project participant	
Monitoring Report version 2.0 (20/04/2016)_Clean version Monitoring Report version 2.0(20/04/2016)_Track version Mokpo_6 th _MR_2834_Emission Reduction_v2.0	
DOE assessment	Date: 20/04/2016
PP excluded methane concentration measured within above period to calculated $W_{CH_4,y}$ and previous $W_{CH_4,y}$ was became 55.48%. KFQ verification team confirmed that 55.48% is correctly calculated based on reliable raw data and applied in the baseline emission calculation and calculation process was checked.	

Table 4. FAR from this verification

Not applicable

FAR ID	xx	Section No.		Date: DD/MM/YYYY
Description of FAR				
Project participant response				Date: DD/MM/YYYY
Documentation provided by project participant				
DOE assessment				Date: DD/MM/YYYY