
 Verification and certification report form for CDM project activities (Version 02.1)	
Complete this form in accordance with the instructions attached at the end of this form.	
BASIC INFORMATION	
Title and UNFCCC reference number of the project activity	<ul style="list-style-type: none"> Title: Mokpo Landfill Gas Recovery Project for Electricity Generation Reference number: 2834
Version number of the verification and certification report	<ul style="list-style-type: none"> Version 2.1
Completion date of the verification and certification report	<ul style="list-style-type: none"> 15/10/2018
Monitoring period number and duration of this monitoring period	<ul style="list-style-type: none"> Monitoring period number : 8th Duration : 01/01/2017 – 12/31/2017
Version number of the monitoring report to which this report applies	<ul style="list-style-type: none"> Version 2.2
Crediting period of the project activity corresponding to this monitoring period	<ul style="list-style-type: none"> From 18/02/2010 to 17/02/2020
Project participants	<ul style="list-style-type: none"> Hanwha Corporation (Republic of Korea) Hanwha Corporation (Switzerland)
Host Party	<ul style="list-style-type: none"> Republic of Korea
Applied methodologies and standardized baselines	<ul style="list-style-type: none"> Applied methodology : AMS-I.D (version 13), AMS-III.G(version 06.0) No standardized baseline(s) applicable
Mandatory sectoral scopes linked to the applied methodologies	<ul style="list-style-type: none"> Sectoral scope: 1-Energy Industry 13-Waste handling and Disposal
Conditional sectoral scope(s) linked to the applied methodologies	<ul style="list-style-type: none"> No conditional sectoral scope(s) linked to the applied methodology
Estimated amount of GHG emission reductions or GHG removals for this monitoring duration in the registered PDD	<ul style="list-style-type: none"> Amount estimated in PDD for 2017: 26,780 tCO₂e
Certified amount of GHG emission reductions or GHG removals for this monitoring period	<ul style="list-style-type: none"> 46,241 tCO₂e
Name and UNFCCC reference number of the DOE	<ul style="list-style-type: none"> Name: Korean Foundation for Quality (KFQ) Reference number: E-0025

Name, position and signature of the approver of the verification and certification report	Soon Hong YEOM  Managing Director of Sustainability management institute
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SECTION A. Executive summary

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 8th monitoring period is 01/01/2017 ~ 12/31/2017. This report contains the findings from the verification and a certification statement for the certified emission reductions.

Verification objective

Verification is the periodic, thorough 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 from 01/01/2017 to 12/31/2017 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 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 complete in accordance with 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 participant. Only verification activities after the publication of the MR on the UNFCCC CDM website have been used

as a basis for conclusion of verification.

The verification process includes desk review of the MR 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. CARs, CLs, and FARs). Upon successful closing of the CARs and CLs raised (if any), the draft verification report is prepared. The draft verification report reviewed by a technical reviewer according to KFQ's internal quality assurance procedures. If no further findings are raised the final verification report is prepared and reviewed once again.

The data presented in the MR 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

Title of project activity	Mokpo Landfill Gas Recovery Project for Electricity Generation
UNFCCC Reference Number	2834
Project Parties	Republic of Korea (Host) Switzerland
Project Participants	Hanwha Corporation. (Korea) Hanwha Corporation. (Switzerland)
Baseline and monitoring methodology	AMS I.D: Grid connected renewable electricity generation (version 13) AMS III.G: Landfill methane recovery (version 06)
Location of the project activity	Address Daeyang-dong Mokpo City, Jeollanam-do, Republic of Korea GPS Coordinates: Longitude: 126.4096 °E // Latitude: 34.8328°N
Registration Date	18/02/2010
Crediting Period	18/02/2010 to 17/02/2020
Period verified in this verification	01/01/2017 to 31/12/2017

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, generated electricity and emission reduction calculation were confirmed as per the PDD (version 6.0, 12/06/2017).

Conclusion

KFQ has performed the verification of the emission reductions reported for the project activity 'Mokpo Landfill Gas Recovery Project for Electricity Generation' in the republic of Korea (UNFCCC Registration Ref. No. 2834) for the period from 01/01/2017 to 31/12/2017.

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 monitoring system and daily operational record 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 registered project's baseline, its monitoring plan and its associated documents.

The implementation of the project resulted in 46,241 tCO₂e of emission reductions during the period from 01/01/2017 to 31/12/2017 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 MR (Version 2.2) 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 registered PDD (version 6.0, 12/06/2017).

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 01/01/2017 to 31/12/2017 amount to 46,241 tCO₂e.

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	JEONG	Yu Shim	KFQ	√	√	√	√
2.	Verifier	IR	LEE	Mi Jung	KFQ	√	√	√	√
3	Verifier		KANG	Yeong Gyeong	KFQ	√	√	√	√

(*) means a personnel with technical expertise in technical area 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	YOON	Sung Han	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	<i>Number of Monitoring parameters</i>	L	<i>Methodology and tool require a rather low number of monitoring parameter.</i>	<i>In response of that risk, the KFQ verification team nevertheless included three verifiers in total and visited on-site in order to cover/ review all monitoring parameters in a complete and detailed manner.</i>
2	<i>Error rate in Monitoring report</i>	L	<i>Expert organization is involved in compilation of MR as well as calculation.</i>	<i>In response of that risk, the KFQ verification team focused on systematic consistency and error checks.</i>
3	<i>Familiarity with Monitoring system</i>	L	<i>This is 8th monitoring period Expert organization is involved in the periodic inspection of monitoring equipment</i>	<i>In response to that risk, the KFQ verification team checked the existence of any and all monitoring instruments as well as their valid calibration, independently from the fact that the PPs would be familiar with the monitoring system.</i>

4	QA/QC	L	Stable QA/QC system has been implemented.	In response to that risk, the KFQ verification team focused on periodic calibration and QA/QC activities performed as well as on plausibility check in order to ensure data quality.
5	Data flow	M	Transmitted to the spreadsheet automatically	In response to that risk, the KFQ verification team checked the safeguard measures for raw data and crosschecked raw data with the MS Excel spreadsheets on a random sampling basis, in an extent to ensure the functioning of the transferring system.
6	Recalculation	M	Calculation is performed in excel spreadsheet applying formulae. However, recalculation is done manually.	In response to that risk, the KFQ verification team firstly checked on the existence of omissions of events for recalculations and secondly reviewed all recalculations in detail.

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 them. 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 verifications (ver. 02)".

C.2. Consideration of materiality in conducting the verification

Some of the detected findings has influenced on the amount of emission reductions, but occurred in isolation and is immaterial. As the finding could be considered as simple error, not systematic reoccurring error, the verification team decided that no additional audit procedures need to be conducted in order to reach a reasonable level of assurance and 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/document review

KFQ's verification is based on the monitoring documentation provided by the PP especially the MR (Version 01.0 dated 23/04/2018, published on 03/05/2018) and the ER calculation spreadsheets. Furthermore, the registered 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. CDM Validation and Verification Standard for Project Activities, Clean Development Mechanism Project Standard, Clean Development Mechanism Project Cycle Procedure, Checklist for requests for post-registration changes to project activities and Checklist for requests for issuance for project activities 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;
- Review the monitoring plan contained in the registered 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 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 MR was performed during the site visit at project site on 01/06/2018. 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 MR 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: 01/06/2018				
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	01/06/2018	Yu Shim JEONG Mi Jung LEE Yeong Gyeong KANG
2	Review of the complete data flow from data generation, aggregation, recording, calculation to reporting of the monitoring parameters.	Mokpo	01/06/2018	Yu Shim JEONG Mi Jung LEE Yeong Gyeong KANG
3	Confirmation of the complete & correct implementation of procedures for the operation and data collection.	Mokpo	01/06/2018	Yu Shim JEONG Mi Jung LEE Yeong Gyeong KANG
4	Verification of the information provided in the MR and documentation with other sources.	Mokpo	01/06/2018	Yu Shim JEONG Mi Jung LEE Yeong Gyeong KANG
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	01/06/2018	Yu Shim JEONG Mi Jung LEE Yeong Gyeong KANG
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	01/06/2018	Yu Shim JEONG Mi Jung LEE Yeong Gyeong KANG

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	01/06/2018	General support, Facilities, instruments and analysis, QA/QC, calculation	Yu Shim JEONG Mi Jung LEE Yeong Gyeong KANG
2	CHOI	Jin Young			General support	
3	KIM	Jung Yeul			QA/QC, Calculation, Reporting and general support	
4	KIM	Yae Won	Roen Consulting Co., Ltd.			

D.4. Sampling approach

As per the requirements set out in CDM Validation and Verification Standard for Project Activity (Version 01.0), random sampling has been applied, as relevant for the present case in the Project Activity, where no sampling approach was applied by the PP.

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

Sampling plan when the verification team planned for verification needed not to be revised as no omissions in the detection process of events related to emission reductions were found.

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

D.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) raised

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
Compliance of the monitoring report with the monitoring report form	0	0	0
Compliance of the project implementation and operation with the registered PDD	0	0	0
Post-registration changes	1	0	0
Compliance of the registered monitoring plan with the methodologies including applicable tools and standardized baselines	0	0	0
Compliance of monitoring activities with the registered monitoring plan	0	0	0
Compliance with the calibration frequency requirements for measuring instruments	0	0	0
Assessment of data and calculation of emission reductions or net removals	1	3	0
Assessment of reported sustainable development co-benefits	1	0	0
Global stakeholder consultation	0	0	0
Others (please specify)	0	0	0
Total	3	3	0

The objective of this phase of the verification was to resolve any issues which were 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:

- Non-conformities with the monitoring plan or methodology are found in monitoring and reporting and has not been sufficiently documented by the project participants, or if the evidence provided to prove conformity is insufficient;
- Modifications to the implementation, operation and monitoring of the registered project activity has not been sufficiently documented by the project participants;
- Mistakes have been made in applying assumptions, data or calculations of emission reductions which will impact the quantity of emission reductions;
- 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 rules and 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 MR provided by the PP against the latest MR form in order to determine, whether the MR is in compliance with it.
Findings	It was found that there are no deviations between the MR and the latest monitoring report form (version 06.0).
Conclusion	The verification team concludes that the MR (version 2.2) is in compliance with the latest monitoring report form (Version 06.0) and the instructions therein.

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

During the validation the validating DOE might have raised issues that could not be closed or resolved during the validation stage. For this purpose FARs might have been raised. Likewise FARs might have been raised in the course of previous verifications.

In the course of this verification the latest version of the PDD and the previous verification report, where applicable, have been checked in order to identify any remaining forward action requests.

For the current monitoring period the following applies:

- i) Open issues from validation
 - There were no open issues which have been addressed in the latest version of the validation report.
- ii) Open issues from previous verifications
 - There were no open issues which have been addressed in the previous verification report.

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

Means of verification	<p><u>Physical project implementation</u></p> <p>During the on-site visit, the KFQ verification team visually inspected the installations of the project activity as well as instrumentations necessary for the monitoring of the emission reductions and checked, whether all physical features of the CDM Project activity, including the data collection systems and storage, have been implemented in accordance with the registered PDD (version 6.0 dated 12/06/2017). Also, the KFQ verification team reviewed the documentation in respect of start-up and operation of the systems, monitoring instrument specifications including containing details such as instrument history and measuring ranges.</p> <p><u>Project operation</u></p> <p>The verification team checked raw data of LFG flow rate and methane fraction recorded in every 8 seconds, records daily/weekly/monthly electricity export, monthly bills of electricity import, maintenance & calibration history, and event log files. In addition to this, verification team interviewed relevant plant staff to check out actual operation especially events occurred such as maintenance and error in monitoring system as indicated in the MR to understand operational 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 and crosschecked by the KFQ verification team. Furthermore, the latest organizational arrangements were checked by means of interviews with relevant staff from Hanwha Corporation.</p> <p><u>Consecutive monitoring period</u></p> <p>The verification team checked monitoring period of previous verifications through interviews with staff from Hanwha Corporation as well as history of requests for</p>
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	issuance provided by UNFCCC website to confirm consecutive monitoring periods of this project activity.
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/well and adding new wellhead/vertical well is very natural to operate landfill site from the point of view of verification team's expertise. In this monitoring period, there was no change in location and number of existing wellhead/well and no additional wellhead/well compare to the last verification and the registered PDD. Through site-visit and review of relevant document, verification team could not identify any changes were occurred during this monitoring period against the registered PDD.</p> <p><u>Project operation</u></p> <p>Operation of the monitoring system & data collection system were operational during the monitoring period - the maintenance/ calibration periods of the monitoring instruments performed during the monitoring period and as described in the MR are complete, respective re-calculation of emission reductions during times of observations (if applicable) were done correctly in the project spreadsheets and in accordance with the registered PDD and the applied methodology.</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 or used the values from the work log. To check events during this monitoring period especially that related to ER calculation, verification team reviewed daily work log to identify number of events, type of event, reason of event occurrence and timeslot of each events. After this, to check exact start and end time of each event, verification team crosscheck it with daily raw data which show methane fraction of measured LFG at an interval of 10 seconds. Additionally, to prevent any omission of events that shall be considered in ER calculation, verification team also checked observation record reported by site operator hourly in daily work log. Finally all of events identified through above mentioned process were cross-checked against the event listed in monitoring report and ER calculation spreadsheet.</p> <p>In conclusion, verification team confirmed that all the events to be considered in ER calculation especially excluding data are well reflected in ER calculation without any omission.</p> <p>The monitoring system and data collection system were fairly operated during this monitoring period.</p> <p><u>Management system and Quality assurance</u></p> <p>KFQ found that the project is operated and monitored by Hanwha Corporation, responsibility for checking & reporting of data under the CDM activity has been contracted to Roen Consulting Co., Ltd. The procedures & responsibilities are described in the MR and are considered and applied in full. With respect to quality control and quality assurance, the KFQ verification team found that the monitoring systems are designed as an automatic process, so the involvement of the personnel during normal operation is minimised. In case of any deficiency, appropriate procedures are in place.</p> <p>KFQ found that the quality assurance and quality control procedures in terms of equipment operation, maintenance, calibration as well as data reporting are covered by project operator's management system and found to be valid during the whole monitoring period. Hanwha Corporation covers all CDM activities in the internal, external audit and management reviews.</p>

	<p><u>Consecutive monitoring period</u></p> <p>This is the 8th monitoring period since registration of this project activity. Previous monitoring reports were already published on the UNFCCC CDM website in a consecutive manner and completed verification of their respective monitoring periods. Thus, the verification team of this monitoring period confirm monitoring periods of this project have been consecutive.</p>
Conclusion	<p>KFQ confirms that the project has been implemented according to the description in the registered PDD.</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 registered PDD; and • All other relevant information provided in the MR is fully in accordance with respective information stated in the registered PDD; and • The information on project operation, the management system and quality assurance are complete, correct and in accordance with the registered PDD; and • The management system and quality assurance and related procedures have implemented as described in the MR and in accordance with the registered PDD. • The monitoring periods of this project have been consecutive. .

E.4. Post-registration changes

E.4.1. Temporary deviations from the registered monitoring plan, applied methodologies or applied standardized baselines

There were no temporary deviations applied to this monitoring period.

E.4.2. Corrections

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

However, there was correction during 7th verification as below and it was approved on 07/09/2017 (PRC-2834-002):

- Each engine type installed at the project site due to typo in the registered PDD.

Please kindly refer to registered PDD (version 6.0, 12/06/2017) for above corrections.

E.4.3. Change to the start date of the crediting period of the project activity

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

E.4.4. Inclusion of a monitoring plan

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

E.4.5. Permanent changes from registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines or other applied standards or tools

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

However, there was correction during 4th verification as below and it was approved on 06/03/2014 (PRC-2834-001):

- Addition of new watt hour meter to measure exported electricity for second generator as per national regulation, 'Act on the promotion of the development, use and diffusion of new and renewable energy'.

Please kindly refer to registered PDD (version 6.0, 12/06/2017) for above corrections.

E.4.6. Changes to the project design

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

However, previous PRC history (PRC-2834-001 and PRC-2834-002) of this project activity was not provided in section B.2 of the MR (version 1.0). **(Refer to Appendix 4/ Table 2/ CL ID 01)**. After the PP have submitted the MR (V.2.2), previous PRCs were reported in the MR and the verification can confirmed that this information provided in the MR correspond with the information could get from the UNFCCC website. Thus, the raised CL (ID 01) has been completely resolved.

E.4.7. Changes specific to afforestation and reforestation project activities

N/A

E.5. Compliance of the registered monitoring plan with the methodology including applicable tools and standardized baselines

Means of verification	The KFQ verification team reviewed the monitoring plan contained in the registered PDD against the approved methodology, AMS I. D (version 13) and AMS III.G (version 06), 'Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (Version 04)' and 'Tool to calculate the emission factor for an electricity system (Version 01.1)' which is applied by the project activity.
Findings	The KFQ verification team found that there are no incompliance between the applicable monitoring plan, the applied methodology AMS I. D (version 13) and AMS III.G (version 06), 'Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (Version 04)' and 'Tool to calculate the emission factor for an electricity system (Version 01.1)'. Furthermore it was found that there are no standardized baselines applied in the project activity.
Conclusion	KFQ confirms that the monitoring plan is in accordance with the approved methodology, AMS I. D (version 13) and AMS III.G (version 06), 'Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (Version 04)' and 'Tool to calculate the emission factor for an electricity system (Version 01.1)' applied by the project activity (no standardized baselines are used in the project activity).

E.6. Compliance of monitoring activities with the registered monitoring plan

General statement on data and parameters

Means of verification	The means of verification in relation to the different parts (Information flow and data collection system and monitoring parameters) are stated in detail in the section & tables further below.
Findings	The findings in relation to the different parts (Information flow and data collection system and monitoring parameters) are stated in detail in the section & tables further below.
Conclusion	KFQ confirms that the monitoring is complete and has been carried out in accordance with the monitoring plan and any monitoring activities comply with it. The monitoring plan has been properly implemented and is followed by the PPs. KFQ confirms that all parameters stated in the monitoring plan have been monitored, including project emission parameters, baseline emission parameters (leakage is not applicable) and management and operational system: the responsibilities and authorities for monitoring and reporting are in accordance with the responsibilities and authorities stated in the monitoring plan. KFQ confirms that the equipment used for monitoring is controlled and calibrated in accordance with the monitoring plan, the applied methodology as well as methodological tools and the relevant guidance provided by the CDM Executive

	<p>Board. Details on calibration are given in section E.7 below.</p> <p>KFQ confirms that monitoring results are consistently recorded as per the approved frequency.</p> <p>KFQ confirms that QA/QC procedures have been applied in accordance with the monitoring plan.</p> <p>KFQ confirms that the MR lists each parameter required by the monitoring plan and the information flow (i.e. from data generation, aggregation, recording, calculation and reporting) for these parameters is provided in the MR (The information flow for each parameter is further verified in the following sections).</p> <p>KFQ confirms that the monitoring methodologies and sustaining records are sufficient to enable verification of emission reductions.</p>
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E.6.1. Data and parameters fixed ex ante or at renewal of crediting period

Means of verification	Data and parameters fixed ex-ante as listed in the MR have been crosschecked & reviewed – as applicable – against the monitoring plan in the registered PDD as well as against the applied methodology (AMS I. D (version 13) and AMS III.G (version 06)) and other relevant CDM related documentation.			
Findings	Data & Parameters fixed ex-ante and COMMONLY relevant for all three plants:			
	Data/parameter (description, unit)	Source of data	Value(s) applied	KFQ Findings
	EF _{OM} : Operation Margin Emission Factor - Unit: ton CO _{2e} /MWh - The generation-weighted average CO ₂ emission per electricity unit generated by the existing grid-connected power plants	PDD(version 06) - it was originally adopted from the ‘Statistics of Electric Power in Korea’.	0.6817	Crosscheck of the value with the revised PDD & Monitoring plan and the applied methodology
	EF _{BM} : Build Margin Emission Factor - Unit: ton CO _{2e} /MWh The generation-weighted average CO ₂ emission per electricity unit generated by the additionally constructed power plants	PDD(version 06) - it was originally adopted from the ‘Statistics of Electric Power in Korea’.	0.3933	Crosscheck of the value with the revised PDD & Monitoring plan and the applied methodology
	CEF _{electricity} : CO ₂ emission intensity of the electricity displaced - Unit: ton CO _{2e} /MWh The weighted average of EF _{OM} and EF _{BM}	PDD(version 06) - it was originally adopted from the ‘Statistics of Electric Power in Korea’.	0.5375	Crosscheck of the value with the revised PDD & Monitoring plan and the applied methodology
	A complete set of data covering the monitoring period has been provided to KFQ and been reviewed during verification.			
Conclusion	KFQ confirms that all data and parameters fixed ex ante such as EF _{OM} , EF _{BM} : CEF _{electricity} are explicitly mentioned in the MR and have been correctly and consistently applied. All values are in compliance with relevant documentation such as the PDD & monitoring plan as well as the applied methodology, applied tools and other CDM related documentation, where applicable.			

E.6.2. Data and parameters monitored

Information 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.</p> <p>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</p>
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	<p>monitoring parameters was successfully done by means of following documents and cross checks:</p> <p><i>Data generation and aggregation:</i></p> <ul style="list-style-type: none"> • Calibration records and certificates • Certificate of analysis of the standard test gas for analyzer calibration • Intervals (measuring frequency, reading frequency, recording frequency) of instruments for each instrument are also verified through display panel on-site and DCS generated <p><i>Aggregation to recording:</i></p> <ul style="list-style-type: none"> • Daily and monthly exported electricity generation(From KPX website) • Monthly bills 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><i>Calculation and reporting:</i></p> <ul style="list-style-type: none"> • Crosscheck of implemented calculations in Excel sheets against the PDD formulae • Data cross check between monthly report generated by PP and Excel Sheets
Findings	<p>As stated in the MR and verified by the KFQ verification team, common data flow systems are used in the project activity for the following parameters:</p> <ul style="list-style-type: none"> • Amount of landfill gas combusted in power plant ($LFG_{\text{electricity}, y}$) • Methane fraction in LFG ($W_{CH_4, y}$) • Total amount of exported electricity out of the project ($EL_{\text{EXP}, \text{PJT}, Y}$) • Total amount of imported electricity to meet project requirement ($EL_{\text{IMP}, \text{PJT}, Y}$) <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: Fa • Flow meter for generator 1: Fb • Flow meter for generator 2: Fc <p>Each flow meter sends signals continuously to the data server and the accumulated data 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 is a 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 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. 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 the whole verification period covered under this verification. Respective documents and results were</p>

	made available to KFQ for verification.
Conclusion	The KFQ verification team confirms that the information flow & data collection system meets the requirements of the registered PDD and its monitoring plan as per the applied and approved methodology, AMS I. D (version 13) and AMS III.G (version 06), 'Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (Version 04)' and 'Tool to calculate the emission factor for an electricity system (Version 01.1)'. Intervals (measuring frequency, reading frequency and recording frequency) are applied in accordance with the applied methodology, the above mentioned tools and the monitoring plan.

Assessment on data/ parameters

Detailed assessment on data and parameters monitored is described as below;

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)

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 registered 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	Through the interview plant operator and PP as well as physical site inspection, verification could confirm that there was no changes in LFG management manner during this monitoring period thus it is correct and reasonable to treat F as '0'.

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 that PP applied 25 for GWP of CH ₄ in emission reduction calculation for this monitoring period correctly.

Data/Parameter	LFG_{electricity, v}
Data Unit	Nm ³ /y
Description	Amount of landfill gas combusted in power plant
Source of data used	Gas flow meters

Value(s)	Measured LFG _{electricity,y} (Nm ³)					Applied LFG _{electricity, y} (Nm ³) in ER calculation
	Data	F _b	F _c	F _a	F _{b+c}	
	01/01/2017~18/01/2017	201,679.600	15,162.500	214,388.900	216,842.100	216,842.100
	19/01/2017~18/02/2017	382,815.900	14,974.400	391,116.200	397,790.300	397,790.300
	19/02/2017~18/03/2017	115,299.600	195,056.200	309,627.600	283,431.100	304,307.300 ¹
	19/03/2017~18/04/2017	308,248.200	55,638.900	370,165.200	363,887.100	363,887.100
	19/04/2017~18/05/2017	394,449.000	1.700	395,808.800	394,450.700	394,450.700
	19/05/2017~18/06/2017	388,776.500	26,891.000	408,535.000	415,667.500	415,667.500
	19/06/2017~18/07/2017	306,302.200	58,984.000	365,454.200	365,286.200	365,286.200
	19/07/2017~18/08/2017	360,106.200	30,831.800	394,834.700	390,938.000	390,938.000
	19/08/2017~18/09/2017	406,115.400	0.000	410,093.600	406,115.400	406,115.400
	19/09/2017~18/10/2017	364,207.500	29,036.600	393,837.700	393,244.100	393,244.100
	19/10/2017~18/11/2017	393,488.200	15,480.700	404,773.900	408,968.900	408,968.900
	19/11/2017~18/12/2017	392,025.400	303.300	386,974.900	392,328.700	392,328.700
	19/12/2017~31/12/2017	140,341.900	0.000	143,848.700	140,341.900	140,341.900
	01/01/2017~31/12/2017	4,153,855.600	442,361.100	4,589,459.400	4,596,216.700	4,590,168.200
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 procedures. 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 8~10 seconds on average and sends signals continuously to the data server. And this data is recording in electronic file continuously.</p> <p>While the flow data is transferring to the server, certain data may not be transmit to the data server from the flow meter due to data recording lag thus flow data could not be recorded. In this case PP read total flow during this time period and it is</p>					

¹ Applied LFG_{electricity} for 19/02/2017~18/03/2017 is not sum of Fb+Fc as per QA/QC procedure in the registered PDD. Refer CAR ID 01.

	<p>possible because the figure read by flow meter is accumulated flow data.</p> <p>During this monitoring period, data recording 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 in case of equipment maintenance 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 is correctly applied as '0' 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 2.2.</p> <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) according to internal QA/QC procedures. However it is identified this QA/QC procedures were not applied in baseline emission calculation during this monitoring period (Refer to Appendix 4/Table 2/CAR ID 01). After the PP have submitted the MR (V.2.2) and ER calculation spreadsheet (V.2.2), verification team checked application of this QA/QC procedure and identified that $(F_b + F_c) - F_a$ is bigger than $1,728 \text{ Nm}^3$ on 09/03/2017 and 10/03/2017. Thus PP used smaller flow rate (F_a, reading from main flow meter) on that date in baseline emission calculation as per QA/QC procedure in the registered PDD. Therefore, applied value of $\text{LFG}_{\text{electricity, y}}$ for the period of 19/02/2017~18/03/2017 is adjusted as $304,307.300 \text{ Nm}^3$ (sum of $20,876.200$ (measured by F_a on 09/03/2017 and 10/03/2017) and $283,431.100 \text{ Nm}^3$ (measured by F_b and F_c on 19/02/2017 ~18/03/2017 except 09/03/2017 and 10/03/2017)) in ER calculation.</p> <p>In case of 22/02/2017, $(F_b + F_c)$ is $11,511.200 \text{ Nm}^3$ and F_a is $19,284.200 \text{ Nm}^3$ therefore the differences between these two values are more than $1,728 \text{ Nm}^3$ but $(F_b + F_c)$ is applied rather than F_a in baseline calculation because $(F_b + F_c)$ is smaller.</p> <p>The verification team checked the daily work log, the operating manual, spread sheet of 'Mokpo_8th MR_2834_Emission Reduction' and raw data sheet of 'LFG flow rates & CH4 fraction (Mokpo LFG plant)_data' and confirmed that all data applied to BE calculation are consistent and correct as per the registered PDD.</p>
Conclusion	<p>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 approved frequency.</p> <p>KFQ confirms that the equipment used for monitoring of this parameter is calibrated in accordance with the monitoring plan, the applied methodology as well as methodological tools and the relevant guidance provided by the CDM Executive Board. Details on calibration are given in section E.7 below.</p> <p>KFQ confirms that QA/QC procedures are suitable and have been applied in accordance with the monitoring plan and the applied methodology.</p> <p>The raised CAR (ID 01) has been completely resolved.</p>

Data/Parameter	$W_{\text{CH}_4, y}$
Data Unit	%
Description	Methane fraction in LFG
Source of data used	Methane analyzer
Value(s)	52.421
Means of verification	<p>The measured methane fraction 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</p>

	<p>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 recording lag is occasionally occurred. In that case, PP takes conservative approach to adopt CH₄ concentration with a lower value comparing with measured data with previous measure data in every recording time. Verification team reviewed 'LFG flow rates & CH₄ 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 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. Thus verification team reviewed CH₄ concentration recorded 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), Operation events history, of the Monitoring Report Version 2.2 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>However, verification team found several issued in calculation of weighted CH₄ concentration as below.</p> <ul style="list-style-type: none"> i) Weighted CH₄ concentration on 16/03/2017 and 20/03/2017 is not calculated correctly as minus CH₄ concentration for certain times on these two days in raw data were used without any correction even there is CH₄ concentration recorded hourly in work log. ii) In the course of calculation of weighted CH₄ concentration on 04/05/2017 and 27/05/2017, the CH₄ concentration from work log was used for the period of 16:17:53~18:10 on 04/05/2017 and 11:00~13:26 on 27/05/2017 due to monitoring system error but it was not consistent concentration in work log. iii) When calculate weighted CH₄ concentration on 01/01/2017, 03/01/2017, 18/01/2017, 13/02/2017, 20/02/2017, 18/05/2017, 19/05/2017, 09/07/2017, 04/08/2017, 26/12/2017 (total 11 days), PP applied the lowest CH₄ concentration from raw data on each day but the reason of this approach was not explained by PP during on-site assessment. iv) LFG flow rate and CH₄ concentration on 04/05/2017(from 16:17:53 to 18:10:56) and 27/05/2017(from 11:00:04 to 13:26:16) were not recorded due to monitoring system error thus PP adopted those values in work log which were measured hourly in calculation of amount of LFG combusted in power plant and weighted average CH₄ concentration of each date. But those adopted CH₄ concentration were not consistent with the value from

	<p>the work log of 04/05/2017 and 27/05/2017. Also, this operational event was not included in the operation events history (table B-1) in the monitoring report. Additionally, LFG flow rate and CH₄ concentration from work log were also used in calculation of amount of LFG combusted in power plant and weighted average CH₄ concentration of 25/5/2017, 17/10/2017, 21/11/2017 and 23/11/2017 due to monitoring system error but these were not included in the operation events history (table B-1) in MR (version 1.0). <u>(Refer to Appendix 4/Table 2/CAR ID 02).</u></p> <p>After the PP have submitted the MR (V.2.2), complete operational events during this monitoring period were reported in the MR and there are no inconsistencies between the MR and actual situation.</p> <p>For the CAR ID 02 mentioned above, it is corrected as below:</p> <ul style="list-style-type: none"> i) Applied CH₄ concentration from work log for certain time period on 16./03/2017 and 20/03/2017 and weighted CH₄ methane on each date is re-calculated and applied in weighted average CH₄ concentration for this monitoring period. ii) Applied CH₄ concentration from work log for the period of 16:17:53~18:10 on 04/05/2017 and 11:00~13:26 on 27/05/2017 and verification team confirmed that it is consistent with the work log. iii) PP explained that applying the lowest CH₄ concentration of each date on above mentioned 11 days in MR version 1.0 as per QA/QC procedure in the registered PDD because methane concentration is slightly unstable during maximum 12 minutes. However, PP analyzed the cause of this unstable period and identified that this unstable is right after generator shit, generator trip and generator restart. And unstable period is within less than 12 minutes. Thus PP reinterpreted as it is normal operation status and finally applied actual measured concentration on that date. Verification team also reviewed raw data and concluded that PP approach is appropriate and acceptable in the point of verification team's expertise. . iv) Applied CH₄ concentration from work log for 04/05/2017 and 27/05/2017, and verification team confirmed that it is consistent with the work log. Also this operational event is included in table B-1 in MR(version 2.2) thus verification team could confirmed that there is no omission of operational events to be considered in ER calculation. <p>Especially weighted CH₄ concentration is finally recalculated correctly and it is applied in ER calculation according to the registered PDD. Due to recalculation of weighted CH₄ concentration final value in MR version 2.2 is higher than it reported in MR version 1.0 and it leads increasing emission reduction achieved in this monitoring period.</p>
Conclusion	<p>Methane fraction in LFG is measuring by methane analyser continuously and it is sending to the data server. The measured data is recording in electronic file continuously at 8~10 seconds interval.</p> <p>Verification team re-checked daily log sheet with ER calculation sheet and could confirmed that 52.421% is correctly calculated $W_{CH_4,y}$ for this monitoring period.</p> <p>KFQ verification team confirmed that 52.421% is correctly calculated based on reliable raw data and applied in the baseline emission calculation and calculation process was checked.</p> <p>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 approved frequency.</p> <p>KFQ confirms that the equipment used for monitoring of this parameter is calibrated in accordance with the monitoring plan, the applied methodology as well as methodological tools and the relevant guidance provided by the CDM Executive Board. Details on calibration are given in section E.7 below.</p> <p>KFQ confirms that QA/QC procedures are suitable and have been applied in accordance with the monitoring plan and the applied methodology.</p>

	The raised CAR (ID 02) has been completely resolved.
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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)	<table border="1"> <thead> <tr> <th>Date</th><th>Wa</th><th>Wc</th><th>Total EL_{EXP} (MWh)</th></tr> </thead> <tbody> <tr><td>01/01/2017~18/01/2017</td><td>258.602</td><td>20.860</td><td>279.462</td></tr> <tr><td>19/01/2017~18/02/2017</td><td>462.749</td><td>18.916</td><td>481.665</td></tr> <tr><td>19/02/2017~18/03/2017</td><td>142.070</td><td>245.334</td><td>387.403</td></tr> <tr><td>19/03/2017~18/04/2017</td><td>422.598</td><td>74.035</td><td>496.633</td></tr> <tr><td>19/04/2017~18/05/2017</td><td>509.065</td><td>0.000</td><td>509.065</td></tr> <tr><td>19/05/2017~18/06/2017</td><td>479.373</td><td>30.283</td><td>509.656</td></tr> <tr><td>19/06/2017~18/07/2017</td><td>393.883</td><td>68.183</td><td>462.066</td></tr> <tr><td>19/07/2017~18/08/2017</td><td>468.731</td><td>39.570</td><td>508.301</td></tr> <tr><td>19/08/2017~18/09/2017</td><td>530.719</td><td>0.000</td><td>530.719</td></tr> <tr><td>19/09/2017~18/10/2017</td><td>455.219</td><td>37.501</td><td>492.720</td></tr> <tr><td>19/10/2017~18/11/2017</td><td>493.308</td><td>18.171</td><td>511.478</td></tr> <tr><td>19/11/2017~18/12/2017</td><td>461.747</td><td>0.196</td><td>461.942</td></tr> <tr><td>19/12/2017~31/12/2017</td><td>183.243</td><td>0.000</td><td>183.243</td></tr> <tr><td>01/01/2017~31/12/2017</td><td>5,261.305</td><td>553.049</td><td>5,814.354</td></tr> </tbody> </table>			Date	Wa	Wc	Total EL _{EXP} (MWh)	01/01/2017~18/01/2017	258.602	20.860	279.462	19/01/2017~18/02/2017	462.749	18.916	481.665	19/02/2017~18/03/2017	142.070	245.334	387.403	19/03/2017~18/04/2017	422.598	74.035	496.633	19/04/2017~18/05/2017	509.065	0.000	509.065	19/05/2017~18/06/2017	479.373	30.283	509.656	19/06/2017~18/07/2017	393.883	68.183	462.066	19/07/2017~18/08/2017	468.731	39.570	508.301	19/08/2017~18/09/2017	530.719	0.000	530.719	19/09/2017~18/10/2017	455.219	37.501	492.720	19/10/2017~18/11/2017	493.308	18.171	511.478	19/11/2017~18/12/2017	461.747	0.196	461.942	19/12/2017~31/12/2017	183.243	0.000	183.243	01/01/2017~31/12/2017	5,261.305	553.049	5,814.354
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01/01/2017~31/12/2017	5,261.305	553.049	5,814.354																																																												
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 physical inspecting to see 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 meters, Wa and Wc, as described in the registered PDD. Wa measures generated electricity from 1st and 2nd generators, and Wc measures electricity generated by 2nd generator. According to the national regulation, "Act on the promotion of the development, use and diffusion of new and renewable energy", KPX requested PP to measure electricity generation from generator 1 and 2 separately as start date of commercial operation of each generator is different (1st generator: Sept. 2008, 2nd generator: Jun. 2009) thus the purchase unit price of electricity generated by each generator is different and it is out of PP's control. In case that 2 generators operate and generate electricity at same time, monthly sales receipt for electricity generated by 1st generator is automatically calculated and recorded in KPX system by reflecting measurement from Wc. Therefore electricity supplied to the KPX by generator 1 in monthly sales receipt is only for the 1st generator. As mentioned above, due to the purchase unit price of electricity generated by each generator is different and it is under KPX control, there is no doubt to count Wc in Wa and it was confirmed by interview with KPX. Further to this, generator 1 and 2 were not operated simultaneously during this monitoring period and it was checked through daily raw data which shows supplied electricity to the KPX, accumulated amount of electricity generated, operating hour, LFG flow</p>																																																														

	<p>and it's concentration of each generator separately. But it may seem that two generators were operated and generated electricity in the same hour in ER calculation spreadsheet as KPX data (recording from watt-hour meters) shows hourly aggregated electricity export from 2 generators (i.e. if only 1st generator exported electricity from 10:01~10:25 and 10:26~10:59 for 2nd generator respectively, the KPX data for 10h show two amount of electricity exported).</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. According to the evidence, monthly sales receipts provided by KPX, total amount of electricity exported during this monitoring period was correctly applied in ER calculation.</p> <p>While checking sales receipts of electricity provided by KPX, verification team identified that exported electricity to KPX from the generator 1 measured by Wa (generator 1 and 2 were not operated simultaneously during this monitoring period, thus Wa measured only electricity exported from generator 1 to KPX) from 19/01/2017~18/02/2017 is 462.749 MWh but it is 462.805 MWh in MR version 1.0 and emission reduction calculation spreadsheet version 1.0. (Refer to Appendix 4/Table 2/CL ID 02). After the PP have submitted the MR (V.2.2) and ER calculation spreadsheet (V.2.2), verification team checked Wa for the period of 19/01/2017~18/02/2017 is corrected and confirmed that revised EL_{EXP} is used in baseline emission calculation.</p>
Conclusion	<p>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 approved frequency.</p> <p>KFQ confirms that the equipment used for monitoring of this parameter is calibrated in accordance with the monitoring plan, the applied methodology as well as methodological tools and the relevant guidance provided by the CDM Executive Board. Details on calibration are given in section E.7 below.</p> <p>KFQ confirms that QA/QC procedures are suitable and have been applied in accordance with the monitoring plan and the applied methodology.</p> <p>The raised CL (ID 02) has been completely resolved.</p>

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)	<table><tr><th>Date</th><th>Measured EL_{IMP} (MWh)</th></tr><tr><td>01/01/2017~18/01/2017</td><td>0.240</td></tr><tr><td>19/01/2017~18/02/2017</td><td>0.192</td></tr><tr><td>19/02/2017~18/03/2017</td><td>0.096</td></tr><tr><td>19/03/2017~18/04/2017</td><td>0.264</td></tr><tr><td>19/04/2017~18/05/2017</td><td>0.216</td></tr><tr><td>19/05/2017~18/06/2017</td><td>0.432</td></tr><tr><td>19/06/2017~18/07/2017</td><td>1.032</td></tr><tr><td>19/07/2017~18/08/2017</td><td>0.336</td></tr><tr><td>19/08/2017~18/09/2017</td><td>0.048</td></tr><tr><td>19/09/2017~18/10/2017</td><td>0.456</td></tr><tr><td>19/10/2017~18/11/2017</td><td>0.576</td></tr><tr><td>19/11/2017~18/12/2017</td><td>0.264</td></tr><tr><td>19/12/2017~31/12/2017</td><td>1.104</td></tr><tr><td>01/01/2017~31/12/2017</td><td>5.256</td></tr></table>		Date	Measured EL _{IMP} (MWh)	01/01/2017~18/01/2017	0.240	19/01/2017~18/02/2017	0.192	19/02/2017~18/03/2017	0.096	19/03/2017~18/04/2017	0.264	19/04/2017~18/05/2017	0.216	19/05/2017~18/06/2017	0.432	19/06/2017~18/07/2017	1.032	19/07/2017~18/08/2017	0.336	19/08/2017~18/09/2017	0.048	19/09/2017~18/10/2017	0.456	19/10/2017~18/11/2017	0.576	19/11/2017~18/12/2017	0.264	19/12/2017~31/12/2017	1.104	01/01/2017~31/12/2017	5.256
Date	Measured EL _{IMP} (MWh)																															
01/01/2017~18/01/2017	0.240																															
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19/11/2017~18/12/2017	0.264																															
19/12/2017~31/12/2017	1.104																															
01/01/2017~31/12/2017	5.256																															
Means of verification	The total amount of imported electricity from outside of the project site is measured																															

	<p>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 physical inspecting to see 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 monthly bills 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 monthly bills of imported electricity are issued by KEPCO.</p> <p>The verification team checked the monthly bills from KEPCO on total amount of electricity imported from the Grid to the project activity during this monitoring period against the values provided in the monitoring report.</p> <p>While checking monthly bills of imported electricity issued by KEPCO, verification team found that electricity imported from 19/12/2017 to 18/01/2018 is 1.104 MWh (checked through the monthly bill issued in January 2018) and 0.276 MWh was reported as electricity imported from KEPCO for the period of 19/12/2017 ~31/12/2017 (last date of this monitoring period) in MR version 1.0 and project emission calculation spreadsheet. PP explained that 0.276 MWh is calculated electricity imported from 1.104MWh to consider last date of this monitoring period (31 Dec.2017) but evidence of 0.276MWh were not provided to the verification. (Refer to Appendix 4/Table 2/CAR ID 03). After the PP have submitted the MR (V.2.2) and ER calculation spreadsheet (V.2.2), verification team found that PP used 1.104MWh as electricity imported from 19/12/2017 to 31/12/2017 due to electricity bill from KEPCO is only issuing monthly basis thus there is no evidence to confirm imported electricity from 19/12/2017 to 31/12/2017 is 0.276 MWh. Therefore PP applied 1.104MWh for the period of 19/12/2017 ~31/12/2017 for project emission calculation in a conservative manner.</p>
Conclusion	<p>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.</p> <p>KFQ confirms that monitoring results of this parameter are consistently recorded as per the approved frequency.</p> <p>KFQ confirms that the equipment used for monitoring of this parameter is calibrated in accordance with the monitoring plan, the applied methodology as well as methodological tools and the relevant guidance provided by the CDM Executive Board. Details on calibration are given in section E.7 below.</p> <p>KFQ confirms that QA/QC procedures are suitable and have been applied in accordance with the monitoring plan and the applied methodology.</p> <p>The raised CAR (ID 03) has been completely resolved.</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 the 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.

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, 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 Number	<ul style="list-style-type: none"> F_a(Main flow meter): GR-160994 F_b(Flow meter for 1st generator): GR-160995 F_c(Flow meter for 2nd generator): 906044A (used until 21/03/2017) GR-170302(used from 21/03/2017) 																		
Type	Thermal mass flow meter																		
Accuracy level	- 0.5 % for F _a , F _b and F _c (GR-170302) - 1% for F _c (906044A)																		
Calibration entity	Golden Rules Co., Ltd. for F _a and F _b Flow Technology Co., Ltd. for F _c																		
Calibration frequency	3 years																		
Previous calibration (if applicable)	<table border="1"> <thead> <tr> <th></th><th>F_a (Main flow meter)</th><th>F_b (Flow meter for 1st generator):</th><th>F_c (Flow meter for 2nd generator): 906044A</th><th>F_c (Flow meter for 2nd generator): GR-170302</th></tr> </thead> <tbody> <tr> <td>Date</td><td>31/03/2015~ 01/04/2015</td><td>31/03/2015~ 01/04/2015</td><td>02/04/2012~ 03/04/2012</td><td>-</td></tr> <tr> <td>Validity</td><td>30/03/2018</td><td>30/03/2018</td><td>01/04/2015</td><td>-</td></tr> </tbody> </table>					F _a (Main flow meter)	F _b (Flow meter for 1 st generator):	F _c (Flow meter for 2 nd generator): 906044A	F _c (Flow meter for 2 nd generator): GR-170302	Date	31/03/2015~ 01/04/2015	31/03/2015~ 01/04/2015	02/04/2012~ 03/04/2012	-	Validity	30/03/2018	30/03/2018	01/04/2015	-
	F _a (Main flow meter)	F _b (Flow meter for 1 st generator):	F _c (Flow meter for 2 nd generator): 906044A	F _c (Flow meter for 2 nd generator): GR-170302															
Date	31/03/2015~ 01/04/2015	31/03/2015~ 01/04/2015	02/04/2012~ 03/04/2012	-															
Validity	30/03/2018	30/03/2018	01/04/2015	-															
Latest calibration	<table border="1"> <thead> <tr> <th></th><th>F_a (Main flow meter)</th><th>F_b (Flow meter for 1st generator):</th><th>F_c (Flow meter for 2nd generator): 906044A</th><th>F_c (Flow meter for 2nd generator): GR-170302</th></tr> </thead> <tbody> <tr> <td>Date</td><td>02/09/2016</td><td>02/09/2016</td><td>31/03/2015~ 01/04/2015</td><td>20/03/2017</td></tr> <tr> <td>Validity</td><td>01/09/2019</td><td>01/09/2019</td><td>30/03/2018</td><td>19/03/2020</td></tr> </tbody> </table>					F _a (Main flow meter)	F _b (Flow meter for 1 st generator):	F _c (Flow meter for 2 nd generator): 906044A	F _c (Flow meter for 2 nd generator): GR-170302	Date	02/09/2016	02/09/2016	31/03/2015~ 01/04/2015	20/03/2017	Validity	01/09/2019	01/09/2019	30/03/2018	19/03/2020
	F _a (Main flow meter)	F _b (Flow meter for 1 st generator):	F _c (Flow meter for 2 nd generator): 906044A	F _c (Flow meter for 2 nd generator): GR-170302															
Date	02/09/2016	02/09/2016	31/03/2015~ 01/04/2015	20/03/2017															
Validity	01/09/2019	01/09/2019	30/03/2018	19/03/2020															
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 verification 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>It was found that the instrument, as stated in the MR (F_a: Main flow meter, F_b: Flow meter for 1st generator and F_c: Flow meter for 2nd generator: GR-170302), physically exists and could be identified by the TAG Number and the serial number.</p> <p>In case of flow meter for 2nd generator (S/N: 906044A) was replaced to GR-170302 on 21/03/2017 even it is valid until 30/03/2018. New flow meter (S/N: GR-170302) is thermal mass flow meter which is same type as previous flow meter but it has higher accuracy level. Verification team checked specification of this</p>																		

	<p>new flow meter and confirmed that type and accuracy level reported in the MR version 2.2 is correct. The verification team reviewed daily work log and internal report document to check date/time of replacement of the flow meter from 906044A to GR-170302 and confirm that 906044A was used until 21/03/2017 without any changes since last 7th verification.</p> <p>It was also found that it has been calibrated regularly according to the calibration frequency described in the registered PDD. No delay of calibration has been observed. It was found, that the instrument had a valid calibration covering the whole verification period and was working within the specified error ranges as per available, suitable certificates.</p>
Conclusion	KFQ confirms that the calibration has been conducted as per the calibration frequency requirements and that the equipment used for monitoring is controlled and calibrated in accordance with the monitoring plan and the applied methodology.

Data/Parameter	W_{CH4,y}				
Data Unit	%				
Description	Methane fraction in LFG				
TAG Number / Serial Number	A8M7282T				
Type	Infrared gas analyzer				
Accuracy level	<ul style="list-style-type: none"> Linearity: 1% Repeatability: 0.5% 				
Calibration entity	National Metrology Institute				
Calibration frequency	3 years				
Previous calibration (if applicable)	<table border="1"> <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 border="1"> <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				
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 gas analyzer at the project site. The KFQ validation team also 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	It was found that the instrument, as stated in the MR physically exists and could be identified by the TAG Number and the serial number. It was also found that it has been calibrated regularly according to the calibration frequency described in the registered PDD. No delay of calibration has been observed. It was found, that the instrument had a valid calibration covering the whole verification period and was working within the specified error ranges as per available, suitable certificates.				
Conclusion	KFQ confirms that the calibration has been conducted as per the calibration frequency requirements and that the equipment used for monitoring is controlled and calibrated in accordance with the monitoring plan and the applied methodology.				

Data/Parameter	EL_{EXP, PJT, y}
Data Unit	MWh
Description	Total amount of exported electricity out of the project
TAG Number / Serial Number	<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 (if applicable)		W _a	W _c
	Date	20/08/2014~26/08/2014	20/08/2014~26/08/2014
	Validity	19/08/2016	19/08/2016
Latest calibration		W _a	W _c
	Date	17/08/2016~19/08/2016	17/08/2016~19/08/2016
	Validity	16/08/2018	16/08/2018
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 2 Watt-hour meters at the project site. The KFQ validation team also 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	It was found that the instrument, as stated in the MR physically exists and could be identified by the TAG Number and the serial number. It was also found that it has been calibrated regularly according to the calibration frequency described in the registered PDD. No delay of calibration has been observed. It was found, that the instrument had a valid calibration covering the whole verification period and was working within the specified error ranges as per available, suitable certificates.		
Conclusion	KFQ confirms that the calibration has been conducted as per the calibration frequency requirements and that the equipment used for monitoring is controlled and calibrated in accordance with the monitoring plan and the applied methodology.		

Data/Parameter	EL _{IMP,PJT,y}						
Data Unit	MWh						
Description	Total amount of imported electricity to meet project requirement						
TAG Number / Serial Number	24142000332						
Type	Watt-hour meter						
Accuracy level	0.5s						
Calibration entity	Korea Testing Certification (KTC)						
Calibration frequency	Once in 2 years						
Previous calibration (if applicable)	<table border="1"> <tr> <td>S/N</td><td>24142000332</td></tr> <tr> <td>Date</td><td>17/06/2014</td></tr> <tr> <td>Validity</td><td>16/06/2016</td></tr> </table>	S/N	24142000332	Date	17/06/2014	Validity	16/06/2016
S/N	24142000332						
Date	17/06/2014						
Validity	16/06/2016						
Latest calibration	<table border="1"> <tr> <td>S/N</td><td>24142000332</td></tr> <tr> <td>Date</td><td>17/08/2016~19/08/2016</td></tr> <tr> <td>Validity</td><td>16/08/2018</td></tr> </table>	S/N	24142000332	Date	17/08/2016~19/08/2016	Validity	16/08/2018
S/N	24142000332						
Date	17/08/2016~19/08/2016						
Validity	16/08/2018						
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 Watt-hour meter at the project site. The KFQ validation team also 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	It was found that the instrument, as stated in the MR physically exists and could be identified by the TAG Number and the serial number. It was also found that it has						

	been calibrated regularly according to the calibration frequency described in the registered PDD. No delay of calibration has been observed. It was found, that the instrument had a valid calibration covering the whole verification period and was working within the specified error ranges as per available, suitable certificates.
Conclusion	KFQ confirms that the calibration has been conducted as per the calibration frequency requirements and that the equipment used for monitoring is controlled and calibrated in accordance with the monitoring plan and the applied methodology.

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), the registered PDD (Version 6.0 dated on 12/06/2017) as well as relevant tools applied. 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>									
Findings	<p>The baseline GHG emissions have been found to be 46,244.214tCO₂e 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.</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 and AMS III.G Version 06) and the registered PDD (Version 6.0 dated on 12/06/2017).</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 MR 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 MR, 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 registered 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 DCS, 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>46,244.214 tCO₂e</td></tr><tr><td>MD_y</td><td>= LFG_{electricity, y} x W_{CH4,y} X D_{CH4,y} x GWP_{CH4}</td><td>43,118.998 tCO₂e</td></tr></table>	Parameter	Formula	Value	BE _y	= (MD _y - MD _{reg,y}) + EL _{EXP,PJT,y} x CEF	46,244.214 tCO ₂ e	MD _y	= LFG _{electricity, y} x W _{CH4,y} X D _{CH4,y} x GWP _{CH4}	43,118.998 tCO ₂ e
Parameter	Formula	Value								
BE _y	= (MD _y - MD _{reg,y}) + EL _{EXP,PJT,y} x CEF	46,244.214 tCO ₂ e								
MD _y	= LFG _{electricity, y} x W _{CH4,y} X D _{CH4,y} x GWP _{CH4}	43,118.998 tCO ₂ e								

	MD _{req,y}	0
	EL _{EXP,PJT,y}	5,814.354 MWh
	CEF	0.5375 tCO ₂ /MWh
	LFG _{electricity, y}	4,590,168.200Nm ³
	W _{CH4,y}	52.421%
	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.</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 baseline GHG emissions 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>	

E.8.2. Calculation of project GHG emissions or actual net anthropogenic 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 and AMS III.G Version 06), the registered PDD (Version 6.0 dated on 12/06/2017) as well as relevant tools applied. 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>
Findings	<p>The project GHG emissions have been found to be 2.825 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.</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 6.0 dated 12/06/2017), 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 MR 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 MR, 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 registered 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 DCS, 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</p>

	<p>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>2.825 tCO_{2e}</td></tr><tr><td>EL_{IMP,PJT,y}</td><td></td><td>5.256 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	2.825 tCO _{2e}	EL _{IMP,PJT,y}		5.256 MWh	CEF		0.5375 tCO ₂ /MWh
Parameter	Formula	Value											
PE _y	= EL _{IMP,PJT,y} X CEF	2.825 tCO _{2e}											
EL _{IMP,PJT,y}		5.256 MWh											
CEF		0.5375 tCO ₂ /MWh											
Conclusion	<p>KFQ confirms that all required data for calculation of the project GHG emissions were available for the whole verification period.</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 project GHG emissions 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 project 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 and the PDD.
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 activity based on the applied methodology.

E.8.4. Summary 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 and AMS III.G Version 06,) and the PDD (Version 6.0 dated 12/06/2017), 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 46,241 tCO_{2e} for the verification period. It was found that the first day on which CERs are being claimed in this verification period has been correctly specified by the PPs, being 01/01/2017.</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 and AMS III.G Version 06,) and the PDD (Version 6.0 dated 12/06/2017), 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</p>

	<p>MR 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 MR, 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 registered 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 DCS, 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 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 GHG emissions for the covered monitoring period is fully complete and based on suitable and verifiable evidence.</p> <p>KFQ confirms that the first day in which CERs are being claimed in the verification period is 01/01/2017, i.e. later than 31/12/2012. No pro-rata approach is applicable.</p> <p>KFQ finally confirms that the amount of emission reductions claimed by the PPs for the verification period from 01/01/2017 to 31/12/2017, amounting to 46,241tCO₂e, 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 MR.
Findings	<p>KFQ found that the emission reductions for this monitoring period, from 01/01/2017 to 31/12/2017 in the PDD were estimated as 26,780 tCO₂e (value rounded down). The actual emission reductions reported by the PPs during the same period were 46,241 tCO₂e and is thus higher than the value estimated in the PDD.</p> <p>It was found that the PPs have correctly described the situation in the MR as well.</p>
Conclusion	<p>KFQ confirms that the overall emission reductions of the project activity were above the ex-ante estimation in the PDD.</p> <p>KFQ confirms that the emission reductions claimed by the PPs are reasonable.</p>

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

Means of verification	As per the specific instructions of the CDM-VCR-FORM, in this section it is to be explained how the cause of any increase in the actual GHG emission reductions in this monitoring period were assessed in accordance with the applicable verification requirements in the VVS. As there is actual increase of actual GHG emission reductions (refer to E.8.5), the cause of the increase were investigated by PP and KFQ has checked the respective explanation offered by the PPs in the monitoring
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	period.
Findings	<p>The reported emission reductions in the monitoring report during 8th monitoring period is approximately 73% 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 GWP_{CH4}</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 ($BE_{CH4,SWDS,y}$) 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 8.73 m³/min whereas it was 6.40 m³/min in registered PDD. • <u>Waste quantity</u> : Mokpo landfill site is still receiving waste and actual received waste until December 2016 is larger than expected amount of waste in the registered PDD. LFG generated in 2017 may influenced by amount of waste buried up to 2016 and it may cause increasing methane contents in the LFG by its first decay. However, it is identified that actual quantity of waste in 2017 reported in MR version 1.0 is not consistent with the evidence provided by PP (reported material of quality of waste in each month to Ministry of Environment). (<u>Refer to Appendix 4/Table 2/CL ID 03</u>). After the PP have submitted the MR (V.2.2), verification team found that PP revised 2017 actual quality waste which correspond with the value checked by verification team during on-site assessment. • <u>Concentration of methane</u> : W_{CH4} for this monitoring period is 52.421% whereas 50% was applied to estimate annual emission reduction in the PDD. <p>Meanwhile, amount of actual generated electricity (5,814.354MWh) for this monitoring period is slightly smaller than it's expectation in the registered PDD (6,751 MWh). 6,751MWh 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>KFQ confirms that the cause of increase in the actual GHG emissions reductions were well justified during the verification period.</p> <p>KFQ confirms that the emission reductions claimed by the PPs are reasonable.</p> <p>The raised CAR (ID 03) has been completely resolved.</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 MR are 46,241 tCO ₂ e. As described in detail in <i>Section E</i> 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 the registered PDD as well as applicable tools.
Findings	It was found that the project activity is implemented and operated according to the registered 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 registered PDD, the applied methodology.
Conclusion	KFQ arrived at the conclusion that the GHG emission reductions reported in the MR and claimed by the PPs are correctly determined with 46,241 tCO ₂ e for the covered verification period between 01/01/2017 to 31/12/2017. 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.
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E.9. Assessment of reported sustainable development co-benefits

Means of verification	The PPs have neither developed sustainable development co-benefits nor monitored sustainable development co-benefits of the project activity, the section is therefore not applicable in this verification period.
Findings	N/A
Conclusion	N/A

E.10. Global stakeholder consultation

Means of verification	There were no comments received with regard to the stakeholder consultation conducted after the publication of the first monitoring report in accordance with the "CDM project cycle procedure for project activities", the section is therefore not applicable in this verification period.
Findings	N/A
Conclusion	N/A

SECTION F. Internal quality control

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

SECTION G. Verification opinion

Through the verification of the MR of the CDM project activity 'Mokpo Landfill Gas Recovery Project for Electricity Generation' in accordance with VVS (version 01.0), KFQ could confirm that:

- The project activity has been implemented and operated as per the registered PDD (Version 6.0, dated 12/06/2017),
- The installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately,
- The monitoring plan is as per the applied methodology,
- The monitoring plan in MR is as per the monitoring plan in the registered PDD,
- The monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan, and approved methodology including applicable tool(s) and generated GHG emission reductions data,
- The GHG emission reductions in the MR (v.2.2) 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:

Title of project activity	Mokpo Landfill Gas Recovery Project for Electricity Generation
UNFCCC Reference Number	2834
Date of registration	18/02/2010
Registered PDD	12/06/2017 (Version 6.0)
Methodology applied	AMS-I.D (Version 13) AMS-III.G (Version 06)

Final version of MR	2.2 (dated 11/10/2018)
Crediting period	18/02/2010 to 17/02/2020
Monitoring period	01/01/2017 to 31/12/2017
Total GHG emission Reductions Verified	Baseline emissions: 46,244 tonnes CO _{2e} Project emissions: 3 tonnes CO _{2e} Leakage: 0 tonnes CO _{2e} Emission reductions: <u>46,241 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 complies with all applicable CDM requirements.

SECTION H. Certification statement

Korean Foundation for Quality has performed the periodic verification of the emission reductions that have been reported for the CDM project activity: 'Mokpo Landfill Gas Recovery Project for Electricity Generation' (UNFCCC Registration Ref. No. 2834) for the period 01/01/2017 to 31/12/2017.

The PPs are responsible for the collection of data in accordance with the monitoring plan 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 methodology AMS-I.D (version 13) and AMS-III.G (version 06), the registered PDD of 12/06/2017 (version 6.0), the validation report (dated 17/02/2010) and the MR (version 2.2) dated 11/10/2018. The verification included i) checking whether the provisions of the monitoring methodology and the monitoring plan were consistently and appropriately applied and ii) the collection of evidence supporting the reported data.

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 on the reported GHG emission reductions.

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 from 01/01/2017 to 31/12/2017 are fairly stated in the MR (v.2.2).

The data generation, aggregation, recording, calculation and reporting of GHG emission reductions were conducted correctly on the basis of the approved baseline and monitoring methodology AMS-I.D (version 13) and AMS-III.G (version 06), and the monitoring plan contained in the registered PDD.

Hence, KFQ is able to certify that the emission reductions from the 'Mokpo Landfill Gas Recovery Project for Electricity Generation' during the period from 01/01/2017 to 31/12/2017 are 46,241 tCO_{2e}.

Signed on behalf of the Korean Foundation for Quality

Signature : 

Name : Soon Hong YEOM, Managing Director

Date : 15/10/2018

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: Yu Shim JEONG

Qualification:

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

Scopes of Expertise:

Technical Area (TA)

- 1.2 Renewables
- 5.1 Chemical Industry
- 5.2 Caprolactam, nitric acid, adipic acid
- 11.1 Emission of Fluorinated gases
- 11.2 Refrigerant gas production

She is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 16 May 2016.

Sustainability Management Institute
Sang Yeon PARK



CERTIFICATE OF COMPETENCE

Name: Mi Jung LEE

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
- 3.1 Energy demand
- 5.2 Carprolactam, nitric and adipic acid
- 11.1 Emission of Fluorinated gases
- 11.2 Refrigerant gas production
- 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 14 September 2017.

Sustainability Management Institute
Yu Shim JEONG



CERTIFICATE OF COMPETENCE

Name: Yeonggyeong KANG

Qualification:

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

Scopes of Expertise:

Technical Area (TA)

1.2 Renewables

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 22 March 2018.

Sustainability Management Institute
Mi Jung LEE



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
- 11.2 Refrigerant gas production
- 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 16 May 2016.

Sustainability Management Institute
Sang Yeon PARK

Appendix 3. Documents reviewed or referenced

No	Author	Title	References to the document	Provider
1	Project participants	Monitoring report : 8 th monitoring report_2834_Ver 1.0 8 th monitoring report_2834_Ver 2.2	23 April 2018 11 October 2018	Hanwha Corporation
2	Project participants	ER calculation spreadsheet : Mokpo_8 th MR_2834_Emission Reduction_v2.2	11 October 2018	Hanwha Corporation
3	Project participants	CDM Project Design Document : Mokpo Landfill Gas Recovery Project for Electricity Generation: - Version 06	https://cdm.unfccc.int/filestorage/X/O/P/XOP0WGEHASYC5FMDZ7IQJLK8UN2R96/Revised%20PDD_Project%202834_version%2006_clean%20version.pdf?t=RzB8cGQ4bDFsfDBOv_ktqfj0EV5mz_Xcef2b 12/06/2017	UNFCCC Website Hanwha Corporation
4	Korean Foundation for Quality(KFQ)	PRC validation report PRC-2834-001 PRC-2834-002	https://cdm.unfccc.int/PRCContainer/searchFinalized?ref=&proj_ref=2834&track=&types_op=or&status=	Korean Foundation for Quality(KFQ)
5	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
6	Korean Foundation for Quality(KFQ)	7th verification/certification report for 'Mokpo Landfill Gas Recovery Project for Electricity Generation (Version 3.2)	https://cdm.unfccc.int/filestorage/R/S/X/RSX05QZON9B18WTIVDEJ6YF423GHAK/verification%20report.pdf?t=dzN8cGQ4bDMYfDABNEwT3wM7w8uczcW2GexY	UNFCCC Website
7	Data server	Spreadsheet of daily raw data downloaded from the data server: flow rate, methane fraction	from 01/01/2017 to 31/12/2017	Hanwha Corporation
8	Data server/ Hanwha Corporation	Event log files and daily work log recorded manually	from 01/01/2017 to 31/12/2017	Hanwha Corporation
9	Hanwha Corporation	Monthly report of waste volume in Mokpo Landfill site	from 01/01/2017 to 31/12/2017	Hanwha Corporation
10	Hanwha Corporation	Operating manual –Mokpo LFG Power Plant (Version 24)	18/07/2018	Hanwha Corporation
11	Hanwha Corporation/ KPX	Daily, weekly, monthly record for electricity export and sales receipt of it	from 01/01/2017 to 31/12/2017	Hanwha Corporation
12	KEPCO	Monthly bill for electricity imported	from 01/01/2017 to 31/12/2017	Hanwha Corporation
13	Flow Technology Co., Ltd. /Golden Rules Co., Ltd./ National Metrology Institute/Korea	Calibration report: - $F_a/F_b/F_c$ - gas analyzer - Watt-hour meter (W_a/W_c) - Watt-hour meter (W_b)	from 01/01/2017 to 31/12/2017	Hanwha Corporation

	Testing Certification/K orea Testing Certification			
14	Hanwha Corporation	Internal audit records External audit records Management review reports	2017	Hanwha Corporation
15	CDM Executive Board	<ul style="list-style-type: none"> • Clean Development Mechanism Validation and Verification Standard, version 01.0 • Clean Development Mechanism Project Standard, version 01.0 • Sampling and surveys for CDM project activity and programme of activities, version 07 • Clean Development Mechanism Project Cycle Procedure, version 01.0 • 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 06.0 • Verification and certification report form for CDM project activities, version 010.0 	03/03/2017 03/03/2017 04/05/2017 03/03/2017 28/05/2010 14/03/2008 13/09/2012 20/02/2015 27/03/2015 07/06/2017 11/01/2018 All published under: http://cdm.unfccc.int/Reference/index.html	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

FAR ID	<i>n/a</i>	Section no.	<i>n/a</i>	Date: <i>n/a</i>
Description of FAR				
<i>n/a</i>				
Project participant response				Date: <i>n/a</i>
<i>n/a</i>				
Documentation provided by project participant				
<i>n/a</i>				
DOE assessment				Date: <i>n/a</i>
<i>n/a</i>				

Table 2. CL from this verification

CL ID	01	Section no.	E.4	Date: 01/06/2018
Description of CL				
Previous PRC history (PRC-2834-001 and PRC-2834-002) of this project activity was not provided in section B.2 of the MR (version 1.0).				
Project participant response				Date: 10/08/2018
PP revised the monitoring report to include corrections (PRC-2834-002), permanent changes from registered monitoring plan (PRC-2834-001) and changes to the project design of registered project activity (PRC-2834-002) and its approval date.				
Documentation provided by project participant				
MR (version 2.2)				
DOE assessment				Date: 15/10/2018
PP revised MR (Version 2.2) to include PRC occurs previously and verification team confirmed that the PRC information including approval date in MR version 2.2 is correct and it is checked through UNFCCC website.				

CL ID	02	Section no.	E.6.2	Date: 01/06/2018
Description of CL				
While checking sales receipts of electricity provided by KPX, verification team identified that exported electricity to KPX from the generator 1 measured by Wa (generator 1 and 2 were not operated simultaneously during this monitoring period, thus Wa measured only electricity exported from generator 1 to KPX) from 19/01/2017~18/02/2017 is 462.749 MWh but it is 462.805 MWh in MR version 1.0 and emission reduction calculation spreadsheet version 1.0.				
Project participant response				Date: 10/08/2018
PP revised the monitoring report and ER calculation sheet to correct electricity exported from 19/01/2017~18/02/2017 as 462.749 MWh.				
Documentation provided by project participant				
MR (version 2.2)				
ER calculation sheet (version 2.2)				
DOE assessment				Date: 15/10/2018
PP have submitted the MR (V.2.2) and ER calculation spreadsheet (V.2.2), verification team checked W_a for the period of 19/01/2017~18/02/2017 is corrected and confirmed that correct EL_{EXP} checked through sales receipts of electricity provided by KPX is used in baseline emission calculation.				

CL ID	03	Section no.	E.8.6	Date: 01/06/2018
Description of CL				

It is identified that actual quantity of waste in 2017 reported in MR version 1.0 is not consistent with the evidence provided by PP (reported material of quality of waste in each month to Ministry of Environment).	
Project participant response	Date: 10/08/2018
PP revised the monitoring report with correct quantity of waste in 2017 according to the reporting material of quality of waste which was reported by PP to Ministry of Environment.	
Documentation provided by project participant	
MR (version 2.2)	
DOE assessment	Date: 15/10/2018
PP have submitted the MR (V.2.2) and verification team checked that 2017 waste quantity is revised as 32,453 ton and concluded that it is consistent with the reporting material reported by PP to Ministry of Environment.	

Table 3. CAR from this verification

CAR ID	01	Section no.	E.6.2	Date: 01/06/2018
Description of CAR				
According to the QA/QC procedures in the registered PDD, Daily data of ' $F_b + F_c$ ' and ' F_a ' are also compared while $LFG_{\text{electricity, y}}$ is assessed. The differences between these two reading data could not be exceeding maximum error range (1,728 Nm^3/day : theoretical calculation with each flow meter's accuracy) according to internal QA/QC procedures. However it is identified this QA/QC procedures were not applied in baseline emission calculation during this monitoring period.				
Project participant response				Date: 13/08/2018
PP checked the differences between $(F_b + F_c)$ and F_a and $(F_b + F_c) - F_a$ is bigger than 1,728 Nm^3 on 22/02/2017, 09/03/2017 and 10/03/2017. This $LFG_{\text{electricity, y}}$ for this monitoring period especially for the period of 19/02/2017 ~ 18/03/2017 is re-calculation as per the QA/QC procedures in the registered PDD and applied in ER calculation.				
Documentation provided by project participant				
MR (version 2.2)				
ER calculation sheet (version 2.2)				
DOE assessment				Date: 15/10/2018
After the PP have submitted the MR (V.2.2) and ER calculation spreadsheet (V.2.2), verification team checked application of this QA/QC procedure and identified that $(F_b + F_c) - F_a$ is bigger than 1,728 Nm^3 on 09/03/2017 and 10/03/2017. Thus PP used smaller flow rate (F_a , reading from main flow meter) on that date in baseline emission calculation as per QA/QC procedure in the registered PDD. Therefore, applied value of $LFG_{\text{electricity, y}}$ for the period of 19/02/2017~18/03/2017 is adjusted as 304,307.300 Nm^3 (sum of 20,876.200 (measured by F_a on 09/03/2017 and 10/03/2017) and 283,431.100 Nm^3 (measured by F_b and F_c on 19/02/2017 ~18/03/2017 except 09/03/2017 and 10/03/2017)) in ER calculation.				
In case of 22/02/2017, $(F_b + F_c)$ is 11,511.200 Nm^3 and F_a is 19,284.200 Nm^3 therefore the differences between these two values are more than 1,728 Nm^3 but $(F_b + F_c)$ is applied rather than F_a in baseline calculation because $(F_b + F_c)$ is smaller.				
The verification team checked the daily work log, the operating manual, spread sheet of 'Mokpo_8th MR_2834_Emission Reduction' and raw data sheet of 'LFG flow rates & CH4 fraction (Mokpo LFG plant)_data' and confirmed that all data applied to BE calculation are consistent and correct as per the registered PDD.				

CAR ID	02	Section no.	E.6.2	Date: 01/06/2018
Description of CAR				
<p>The verification team found several issued in calculation of weighted CH₄ concentration as below.</p> <ul style="list-style-type: none"> i) Weighted CH₄ concentration on 16/03/2017 and 20/03/2017 is not calculated correctly as minus CH₄ concentration for certain times on these two days in raw data were used without any correction even there is CH₄ concentration recorded hourly in work log. ii) In the course of calculation of weighted CH₄ concentration on 04/05/2017 and 27/05/2017, the CH₄ concentration from work log was used for the period of 16:17:53~18:10 on 04/05/2017 and 11:00~13:26 on 27/05/2017 due to monitoring system error but it was not consistent concentration in work log. iii) When calculate weighted CH₄ concentration on 01/01/2017, 03/01/2017, 18/01/2017, 13/02/2017, 20/02/2017, 18/05/2017, 19/05/2017, 09/07/2017, 04/08/2017, 26/12/2017 (total 11 days), PP applied the lowest CH₄ concentration from raw data on each day but the reason of this approach was not explained by PP during on-site assessment. iv) LFG flow rate and CH₄ concentration on 04/05/2017(from 16:17:53 to 18:10:56) and 27/05/2017(from 11:00:04 to 13:26:16) were not recorded due to monitoring system error thus PP adopted those values in work log which were measured hourly in calculation of amount of LFG combusted in power plant and weighted average CH₄ concentration of each date. But those adopted CH₄ concentration were not consistent with the value from the work log of 04/05/2017 and 27/05/2017. Also, this operational event was not included in the operation events history (table B-1) in the monitoring report. Additionally, LFG flow rate and CH₄ concentration from work log were also used in calculation of amount of LFG combusted in power plant and weighted average CH₄ concentration of 25/5/2017, 17/10/2017, 21/11/2017 and 23/11/2017 due to monitoring system error but these were not included in the operation events history (table B-1) in MR (version 1.0). 				
Project participant response				Date: 13/08/2018
<p>For the CAR ID 02 mentioned above, it is corrected as below by PP:</p> <ul style="list-style-type: none"> i) Applied CH₄ concentration from work log for certain time period on 16./03/2017 and 20/03/2017 and weighted CH₄ methane on each date is re-calculated and applied in weighted average CH₄ concentration for this monitoring period. ii) Applied CH₄ concentration from work log for the period of 16:17:53~18:10 on 04/05/2017 and 11:00~13:26 on 27/05/2017 iii) Applying the lowest CH₄ concentration of each date on above mentioned 11 days in MR Version 1.0 as per QA/QC procedure in the registered PDD because methane concentration is slightly unstable during maximum 12 minutes. However, PP analyzed the cause of this unstable period and identified that this unstable is right after generator shit, generator trip and generator restart. And unstable period is within less than 12 minutes. Thus PP reinterpreted as it is normal operation status and finally applied actual measured concentration. iv) Applied CH₄ concentration from work log for 04/05/2017 and 27/05/2017, and this operational event is included in table B-1 in MR(version 2.2) 				
Documentation provided by project participant				
MR (version 2.2)				
ER calculation sheet (version 2.2)				
DOE assessment				Date: 15/10/2018

Above mentioned issues in calculation of weighted CH₄ concentration is well re-calculated based on the record in work log as per the registered PDD. Verification team checked calculation process and used values are consistent with its raw data. Especially for the iii), verification team also analyzed unstable period of CH₄ concentration on 11 days and concluded that this kind of unstable period is likely to be occurred specially just after generator shut, generator trip and generator restart. Also as unstable period is within 12 minutes, verification team could accept this period is as normal operation status therefore applying actual measured concentration rather than the lowest methane concentration on that date is appropriate and acceptable in the point of verification team's expertise. Verification team also confirmed that all operational events during this monitoring period is listed in MR version 2.2 and considered in ER calculation.

Due to recalculation of weighted CH₄ concentration final value in MR version 2.2 is higher than it reported in MR version 1.0 and it leads increasing emission reduction achieved in this monitoring period.

CAR ID	03	Section no.	E.6.2	Date: 01/06/2018
Description of CAR				
While checking monthly bills of imported electricity issued by KEPCO, verification team found that electricity imported from 19/12/2017 to 18/01/2018 is 1.104 MWh (checked through the monthly bill issued in January 2018) and 0.276 MWh was reported as electricity imported from KEPCO for the period of 19/12/2017 ~31/12/2017 (last date of this monitoring period) in MR version 1.0 and project emission calculation spreadsheet. PP explained that 0.276 MWh is calculated electricity imported from 1.104MWh to consider last date of this monitoring period (31 Dec.2017) but evidence of 0.276MWh for 19/12/2017~31/12/2017 were not provided to the verification.				
Project participant response				Date: 10/08/2018
PP applied 1.104 MWh as imported electricity from KEPCO to the project site from 19/12/2017 to 31/12/ 2017 and applied it in project emission calculation.				
Documentation provided by project participant				
MR (version 2.2) ER calculation sheet (version 2.2)				
DOE assessment				Date: 15/10/2018
The verification team found that PP used 1.104MWh as electricity imported from 19/12/2017 to 31/12/2017 due to electricity bill from KEPCO is only issuing monthly basis thus there is no evidence to confirm imported electricity from 19/12/2017 to 31/12/2017 is 0.276 MWh. Therefore PP applied 1.104MWh for the period of 19/12/2017 ~31/12/2017 for project emission calculation and verification team concluded that approach is reasonable and PE and ER was calculated in conservative manner.				

Table 4. FAR from this verification

FAR ID	n/a	Section No.	n/a	Date: n/a
Description of FAR				
n/a				
Project participant response				Date: n/a
n/a				
Documentation provided by project participant				
n/a				
DOE assessment				Date: n/a
n/a				