
VERIFICATION AND CERTIFICATION REPORT

Jaroensompong Co.,Ltd.

**Jaroensompong Corporation
Rachathewa Landfill Gas to Energy
Project**

UNFCCC Ref. No.1413

Monitoring Period 1 : 14/03/2008 – 31/12/2008

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Date of Issue:	Project Number:
10-01-2013	CDM.VER0335
Project Title:	
Jaroensompong Corporation Rachathewa Landfill Gas to Energy Project	
Organisation:	Client:
SGS United Kingdom Limited	Jaroensompong Co.,Ltd.
Publication of Monitoring Report:	
Monitoring Period:	14/03/2008 – 31/12/2008
First Monitoring Version and Date:	Version 1, 04/2009
Final Monitoring Version and Date:	Version 8.3, 29/09/2012
Summary:	
<p>SGS United Kingdom Ltd. has performed the first periodic verification of the CDM project Jaroensompong Corporation Rachathewa Landfill Gas to Energy Project, with UNFCCC reference number of 1413, registration date of 14/03/2008 and monitoring period from 14/03/2008 – 31/12/2008. The verification includes confirming the implementation of the monitoring plan of the registered PDD version 3, dated 27/06/2007 and the application of the monitoring methodology as per ACM0001 version 05. A site visit was conducted to verify the data submitted in the Monitoring Report. SGS confirms the following has been reviewed:</p> <ul style="list-style-type: none"> (a) The registered PDD, including the monitoring plan and the corresponding validation report; (b) Monitoring Report; (c) The applied monitoring methodology; (d) Relevant decisions, clarifications and guidance from the CMP and the CDM Executive Board; (e) All information and references relevant to the project activity's resulting in emission reductions. <p>The registered project activity indicated that the Project Participant has installed a LFG collection system and 1MW electricity generator at the Rachathewa site. Recovered LFG will be utilized to generate electricity. Any excess LFG is flared with an opened flare system. The generated electricity will be sold to the Metropolitan Electricity Authority (MEA) under a power purchase agreement. However, the actual installed capacity of gas generator set is 1.1MW (1,100kW) which is not in accordance with the project description as mentioned in the registered PDD (capacity of electricity generator was mentioned as 1MW). So the change to project design of a registered project activity is validated and submitted the change for acceptance by the board as part of the request for issuance which in compliance with incorporated to this verification report as per Clean Development Mechanism Project Cycle Procedure (EB70 Annex4) version 03.1, paragraph 134 and VVS version 3.0 (EB70 Annex3) paragraph 249(a).</p> <p>SGS confirms that the project is implemented in accordance with the validated and revised Project Design Document. The monitoring system is in place and the emission reductions are calculated without material misstatements. Our opinion relates to the projects GHG emissions and the resulting GHG emission reductions reported and related to the valid and registered project baseline and monitoring and its associated documents. Based on the information seen and evaluated we confirm that the implementation of the project has resulted in 27,060 tCO₂e emission reductions during period 14/03/2008 up to 31/12/2008.</p>	
Subject:	
CDM Verification	
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Revision Number:	Date:	Number of Pages:	
0	09-11-2012	102	
1	04-12-2012	100	
2	10-01-2013	109	

Abbreviations

AF	Adjustment Factor
BMA	Bangkok Metropolitan Area
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM EB	CDM Executive Board
CDM PS	CDM Project Standard
CEF	Carbon Emission Factor
CER	Certified Emission Reductions
CH ₄	Methane
CL	Clarification Request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
CoC	Certification of Calibration
COD	Chemical Oxygen Demand
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
EGAT	Electricity Generation Authority of Thailand
ERC	Emission Reduction Calculation
ERCF	Emission Reduction Computation Framework
FA	Full Advantage Co.,Ltd.
GHG	Green House Gas(es)
GWP	Global Warming Potential
HDPE	High Density Poly-Ethylene
IEE	Initial Environmental Evaluation
IPCC	Intergovernmental Panel on Climate Change
JS	Jaroensompong Co.,Ltd.
LFG	Landfill Gas
MEA	Metropolitan Electricity Authority
MOC	Modalities of Communication
MP	Monitoring Plan
MSW	Municipal Solid Waste
MUS	Mitsubishi UFJ Morgan Stanley Securities Co.,Ltd.
MW	Mega Watt
NGO	Non-governmental Organization
ODA	Official Development Assistance
PDD	Project Design Document
PPA	Power Purchase Agreement
PVC	Poly Vinyl Chloride
QA	Quality Assurance
QC	Quality Control
SCADA	Supervisory Control and Data Acquisition
TA	Technical Area
TJ	Tetra Joule
UM	User Manual
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Validation and Verification Standard
WISCO	Wisnu and Supak Co., Ltd.

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1. Introduction

1.1 Objective

SGS United Kingdom Ltd. has been contracted by Jaroensompong Co.,Ltd. (one of the Project Participants of the project) to perform an independent verification of its CDM project Jaroensompong Corporation Rachathewa Landfill Gas to Energy Project. CDM projects must undergo periodic audits and verification of emission reductions as the basis for issuance of Certified Emission Reductions (CERs).

The objectives of this verification exercise are, by review of objective evidence, to establish that:

- The emissions report conforms with the requirements of the monitoring plan in the registered PDD and the approved methodology; and
- The data reported are complete and transparent.

1.2 Scope

The scope of the verification is the independent and objective review and ex post determination of the monitored reductions in GHG emission by the project activity. The verification is based on the validated and registered project design document and the monitoring report. The project is assessed against the requirements of the Kyoto Protocol, the CDM Modalities and Procedures and related rules and guidance.

SGS has, based on the recommendations in the Validation and Verification Standard, employed a risk-based approach in the verification, focusing on the identification of significant reporting risks and the reliability of project monitoring.

Due professional care has been exercised and ethical conduct has been followed by the assessment team during the verification process. The verification report is a fair presentation of the verification activity.

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

1.3 Project Activity and Period Covered

This engagement covers emissions and emission reductions from anthropogenic sources of greenhouse gases included within the project boundary of the following project and period.

Title of Project Activity: Jaroensompong Corporation Rachathewa Landfill Gas to Energy Project

UNFCCC Registration Number: 1413

Monitoring Period Covered in this Report: 14/03/2008 – 31/12/2008

Project Participants: Host Country:

Thailand: Jaroensompong Co.,Ltd.

Annex I Country:

Japan: Mitsubishi UFJ Morgan Stanley Securities Co.,Ltd.

Location of the Project Activity: The Rachathewa landfill, 142/4 Moo 14 Kingkaew Rd, Rachathewa, Bangplee, Samuthprakarn, 10540 Kingdom of Thailand.

The project involves the installation of a landfill gas (LFG) collection system and 1.1 MW electricity generator at the Rachathewa landfill. A LFG collection system design based on horizontal lines and well has been installed at site 1 (the west end of Rachathewa landfill). LFG is recovered at the edges and at the centre of the landfill in which the LFG is drawn via vacuum connected with blower. The recovered LFG is used to generate electricity which is exported to the MEA grid. Excess LFG is flared rather than released to the atmosphere with an opened flare system. The GHG emission reductions are claimed from the methane



destruction (i.e. utilization in the electricity generation unit and flaring) and grid electricity displacement by the LFG based electricity generation.

2. Methodology

2.1 General Approach

SGS performs the verification work using a Periodic Verification Checklist prepared following the VVS. The Periodic Verification Checklist describes the verification approach and the sampling plan.

The checklist gives the assessment team a full understanding of:

- Activities associated with all the sources contributing to the project emissions and emission reductions, including leakage if relevant;
- Protocols used to estimate or measure GHG emissions from these sources;
- Collection and handling of data;
- Controls on the collection and handling of data;
- Means of verifying reported data; and
- Compilation of the Monitoring Report.

Using the Periodic Verification Checklist, SGS verified the implementation of the monitoring plan and the data presented in the Monitoring Report for the period in question. This involved a site visit and a desk review of the Monitoring Report. This verification report describes the findings of this assessment.

Only verification activities undertaken after the publication of the monitoring report on the UNFCCC CDM website were used as a basis for SGS to conclude our verification and submit a request for issuance of CERs to the Board.

2.2 Verification Team for this Assessment

A team of competency has been selected to perform the verification of the project.

Name	Role
Pitipoom Tungsirisuteekul	Lead Assessor
Nattarin Thunsiri	Assessor
Kasamol Sansanakul	Local Assessor
A.T. Surendra	Technical Area expert (TA13.1, Waste handling and disposal)

2.3 Means of Verification

2.3.1 Review of Documentation

The validated PDD, the monitoring report submitted by the client and additional background documents related to the project performance were reviewed. A complete list of all documents reviewed is attached in section 8 of this report.

2.3.2 Site Visits

As part of the verification, the following on-site inspections have been performed by the assessment team (i.e. Lead assessor, Assessor and Local assessor) including the sectoral scope expert.

Location: The Rachathewa landfill, 142/4 Moo 14 Kingkaew Rd, Rachathewa, Bangplee, Samuthprakarn, 10540 Kingdom of Thailand.	
Date: First visit on 01/07/2009 – 02/07/2009 and Second visit on 19/11/2010	
Coverage:	Source of Information / Persons Interviewed
A review of performance records, interviews with project participants and local stakeholders, collection of measurements, observations of established practices and testing of the accuracy of monitoring equipment Review of information of the changes in the project activity and project implementation.	Souwalak Jaroenpoj / Project Manager / JS Kasinee Jaroenpoj / Project Coordinator / JS Suwatchai Kimjit / Project Engineer / JS Numfon Saetang / Project Coordinator / JS Sineenuch Jongjaroontiat / CDM Consultant / MUS Patwalai Ananjanich / CDM Consultant / FA Vazzan Tirangkura / CDM Consultant / FA

2.4 Reporting of Findings

As an outcome of the verification process, the team can raise different types of findings.

In general, where insufficient or inaccurate information is available and clarification or new information is required the team shall raise a Clarification Request (CL) specifying what additional information is required.

Where a non-conformance arises the team shall raise a Corrective Action Request (CAR). A CAR is issued, where:

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

The verification process may be halted until this information has been made available to comply with the requirements of the CDM Executive Board. Failure to address a CL may result in a CAR. Information or clarifications provided as a result of a CL may also lead to a CAR.

A clarification request (CL) will be raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met. All CARs and CLs raised during verification shall be resolved prior to submitting a request for issuance.

Corrective Action Requests and Clarification Requests are raised in the Periodic Verification Checklist. The Project Developer is given the opportunity to “close” outstanding CARs and respond to CLs.

Forward Action Requests (FARs) may be raised during verification for actions where the monitoring and reporting require attention and/or adjustment for the next verification period, which are for the benefit of future projects and future verification activities. These have no impact upon the completion of the verification activity.

All CARs, CLs and FARs for this verification period are included in this report.

2.5 Internal Quality Control

Following the completion of the assessment process and a recommendation by the Assessment Team, all documentation will be forwarded to a Technical Review Team. The task of the Technical Review Team is to check that all procedures have been followed and all conclusions are justified. The Technical Reviewer will either accept or reject the recommendation made by the assessment team.

Technical Review Team

Name	Role
Joe Sun	Technical Reviewer
Shute Li	Technical Area expert (TA13.1, Waste handling and disposal)

3. Verification Findings

3.1 Project Implementation

The project involves the installation of a landfill gas (LFG) collection system and 1.1 MW^{/29/} electricity generator at the Rachathewa landfill. A LFG collection system design based on horizontal lines and well has been installed at site 1 (the west end of Rachathewa landfill). LFG is recovered at the edges and at the centre of the landfill in which the LFG is drawn via vacuum connected with blower. The recovered LFG is used to generate electricity which is exported to the MEA grid. Excess LFG is flared rather than released to the atmosphere with an opened flare system.

As per methodology ACM0001 version 5^{/11/} the applicability criteria to the project activity is as follow:

“This methodology is applicable to landfill gas capture project activities, where the baseline scenario is the partial or total atmospheric release of the gas and the project activities include situations such as:

- a) The captured gas is flared; or
- b) The captured gas is used to produce energy (e.g. electricity/thermal energy), but no emission reductions are claimed for displacing or avoiding energy from other sources; or
- c) The captured gas is used to produce energy (e.g. electricity/thermal energy), and emission reductions are claimed for displacing or avoiding energy generation from other sources. In this case a baseline methodology for electricity and/or thermal energy displaced shall be provided or an approved one used, including the ACM0002 “Consolidated Methodology for Grid-Connected Power Generation from Renewable”. If capacity of electricity generated is less than 15MW, and/or thermal energy displaced is less than 54 TJ (15GWh), small-scale methodologies can be used. ”

The baseline scenario of the project activity is the total atmospheric release of the landfill gas. In the project activity, the LFG is captured to generate the electricity and supply to the national grid. The emission reductions are claimed for displacing or avoiding electricity generation from Thailand national grid. Also, the baseline methodology for electricity displaced is following the methodology AMS I.D version 11^{/11/} because the capacity of electricity generating unit is less than 15 MW (i.e. 1.1 MW). There are no GHG sources which are not listed in the registered PDD. The spatial extent of the project boundary is correctly identified. Hence, this is confirmed that the project activity is still applicable to the applied methodology.

To determine that all monitoring system and metering equipments of the project are in place and has been implemented and operated as per the registered PDD, **CL#01 was raised** to obtain the documentary evidences. In response, the PP provided the equipment procurement list, commissioning report^{/15/}, confirmation letter from the supplier on the test run performance^{/23/} and the agreement for export electricity to Thai National Grid (Power Purchase Agreement)^{/31/}. All documents revealed that all physical monitoring features of the project activity are put in place in accordance with the registered PDD and have been operated since 11/08/2005 as per the commissioning report from the technology provider^{/23/}. This is before the starting date of this first monitoring period (i.e. 14/03/2008). The data logger system, namely WISCO, has been installed since 27/12/2007^{/16/} to facilitate the more efficient data management system to project activity. The documents were verified and found satisfactory as well as observed during the site visit to confirm the actual monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan. There is no delay in the project implementation. Hence, **CL#01 was closed out**.

During the site visit, SGS observed that the 1.1MW LFG electricity generator set is installed whereas the PDD mentioned it as 1 MW. However, SGS has identified and determined that this project design change does not require prior approval by the Board as it is solely of a type listed in appendix 1 of Project standard (i.e. EB70 Annex2, Appendix I, paragraph 6) and is able to submit this change as part of the request for issuance in accordance with the Project cycle procedure (EB70 Annex4, paragraph 135) and CDM Validation and Verification Standard (EB70 Annex3, paragraph 248-249). Details are elaborated in section 3.2 and 3.2.4 of this report.

The data and parameters provided in the Monitoring Report have been verified and found in compliance with that stated in the registered PDD^{/9/}, which has not caused an increase in estimates of the emission reductions in the current monitoring period or is not highly likely to increase the estimates of emission reductions in the future monitoring periods.

CAR#10 was raised towards the comparison of the actual emission reduction claimed in the monitoring period with the estimated in the registered PDD^{/9/} including explanations on any significant change in the emission reduction need to be discussed in the Monitoring Report. In response, the PP submitted the revised Monitoring Report^{/3/}. The reported emission reductions in a particular monitoring period (i.e. 27,060 tCO₂e) are substantially less than the project emission reduction in the revised PDD (i.e. 61,312 tCO₂e). This is mainly due to the difference between the amount of LFG collected and LFG flared ex-post and those of estimated ex-ante. The comparisons of ex-ante and ex-post data are summarized in the table below.

No.	Parameter	Values in the revised PDD ^{/1/}	Value in the final ER ^{/3/}
1	Total amount of LFG recovered	10,142,241 m ³	3,322,475 m ³
2	Flaring efficiency (default value of open flare)	50%	0%
3	Average methane content of LFG	0.576 m ³ CH ₄ /m ³ LFG	0.502 m ³ CH ₄ /m ³ LFG

In the revised PDD^{/1/}, it was forecasted that about 23% of the total LFG would be utilized for the electricity generation and the rest 77% for the flaring, whereas under the actual operation, total recovered LFG is less than that estimated in the registered PDD. As well as, there is no emission reduction that can be claimed from CH₄ destruction in LFG flared (as the flaring efficiency is taken as zero). The monitored methane content that was adopted for ex-post calculation is also lower than the ex-ante estimated value. Theoretically, the lower methane content resulted in the more LFG required for electricity generation. This contributed to the decrease in ex-post amount of LFG utilized for electricity generation compared to that of ex-ante. However, the difference between ex-ante and ex-post values are not a type that attributed to post registration changes in the project design as per CDM Project Standard (EB70 Annex2). The PP's explanation is reasonable and the calculation of emission reductions are discussed in section 4 of this report, **CAR#10 was closed out.**

However the first version of monitoring webhosted on UNFCCC website is complied with VVM track but in later stage the VVS track is effective as per EB65 Annex6 hence **CAR#18 was raised**. In response, the Project Participant provided the revised Monitoring Report complied with the format of the Monitoring Report to VVS track including the information of post registration change. This revised monitoring report has been checked which found satisfactorily and inline to the guidance for completing monitoring report. **Thus CAR#18 was closed out.**

3.2 Post registration changes

SGS, as the DOE contracted by the PP to validate the post-registration changes, is accredited to the validation function for the specific CDM sectoral scope 13.1 (Waste Handling and Disposal). By means of the site visit and documents review, SGS has identified the change to the project design of a registered project activity (i.e. the installation of the 1.1MW LFG electricity generator set whereas the PDD mentioned as 1 MW). However this change does not require prior approval by the board as per requirement in appendix 1 of the project standard (EB65 Annex5). The detail of validation assessment to post registration change is described below in section 3.2.4.

3.2.1 Temporary deviations from registered monitoring plan or applied methodology

Not applicable.

3.2.2 Corrections

Not applicable.

3.2.3 Permanent changes from registered monitoring plan or applied methodology

Not applicable.

3.2.4 Changes to project design of registered project activity

In accordance with paragraph 62(g) of the CDM Modalities and Procedure, the designated operational entity (DOE) contracted by the Project Participant to perform verification shall, "Identify and inform the project participants of any concerns related to the conformity of the actual project activity and its operation with the registered project design document. Project Participants shall address the concerns and supply relevant additional information;"

In conjunction with the EB70 Annex 3 paragraph 247-249, the actual installed capacity of gas generator is 1,100 kW or 1.1 MW instead of 1.0 MW as stated in the registered PDD. SGS, as a contracted verifying DOE, has checked the conformity of the actual project activity and its operation with the registered Project Design Document of the project activity "Jaroensompong Corporation Rachathewa Landfill Gas to Energy Project" by Jaroensompong Co., Ltd. and found that there is a change in the effective output capacity due to increased installed capacity than that described in the PDD^{9/}. In response to this concern, the PP has revised the PDD to reflect the actual installed capacity of the gas generator set. This revision is shown in the PDD version 03.6 dated 29/09/2012^{1/} and has been determined that it does not adversely impact any of the following (i) Additionality of the project activity; (ii) Scale of CDM project activity; and (iii) Applicability and application of Approved Baseline Methodology as outlined in appendix 1 CDM Project Standard (EB70 Annex2) and the relevant guidelines established by the Executive Board (EB70 Annex 3 paragraph 247, 248 and 249 (a)). This actual change is taking into account the types of changes (i.e. IV. Changes to the project design of a registered project activity) as described in appendix 1 of Clean Development Mechanism Project Standard Version 02.1 (EB70 Annex2) which describes the types of changes that do not require prior approval by the Board but shall be submitted as part of the request for issuance in accordance with the project cycle procedure.

According to EB70 Annex 2 paragraph 206 and the registered PDD, the actual installed capacity of gas generator is different from the design described in the PDD (1,100kW or 1.1MW instead of 1MW). This change to the project of a registered project activity has been assessed by the assessment team for the potential impact on the validity of barrier analysis established at the time of project registration which may probably affect the additionality of the project activity as described in the registered PDD^{9/} (EB70 Annex 2 Appendix 1 point 4). Therefore, the additionality of the project activity has been analyzed with respect to the changes identified and is discussed in detail under section 3.2.4.1 of this report.

The validation report has been reviewed by the assessment team and there was no outstanding issue that requires action at this stage. Since this is a first verification of this project activity, it was verified that there are no finding or outstanding issues from previous verification. However, the assessment team has checked the physical features of this project activity. It was identified that the implementation or operation of CDM project activity does not conform to the employed technology as given in the registered PDD. **CAR#16 was raised** for asking the PP to substantiate the reason of the changes identified during the site visit and also clarify whether this change is a permanent change or not. In response, the PP clarified that the Jaroensompong's management has decided to install 1.1MW generator at the time of decision making (i.e this change was known to project proponent prior the implementation of project activity) and the project has never been installed 1MW electricity generator at the Rachathewa site. In addition, the PP had demonstrated the additionality of the project activity using Tool for the demonstration and assessment of additionality, version 03 and only step 3 (Barrier Analysis) was selected to demonstrate additionality (using barriers due to prevailing practice, investment barriers and technological barrier). It is found that these barriers are not

eliminated by increasing the installed capacity of gas generator from 1.0MW to 1.1MW and the project activity remains additionality as per the applied tool.

This is also a permanent change as the project has never been implemented in accordance with description in the registered PDD. Furthermore, it was not realized by PP that 1MW capacity mentioned in the registered PDD is inconsistent with 1.1MW of actual installed capacity prior to the registration of the project activity. The quotation of the biogas generator set from Metro Machinery Co., Ltd.^{/32/}, technology supplier, dated 9/10/2005 has been substantiated as documented evidence because Jaroensompong's management decided to purchase LFG generator based on this quotation. The assessment team has checked this document and found satisfactory.

This quotation of the biogas generator set has been checked and revealed that the 1,100kW capacity of landfill gas engine (with additional information of net 1,000kW) had been offered from the technology supplier and this is found consistent with the actual installation of the project activity which has been checked against the nameplate of the gas generator (1,100kW) as observed during the site visit. The specification of biogas generator set^{/29/} has been substantiated and is found consistent as 1,100kW of installed capacity. The assessment team has also checked the contracted PPA^{/31/} with the Metropolitan Electricity Authority (MEA) dated 14/07/2005. From the PPA, the contracted capacity of electricity purchasing is limited to 1MW. This can be assured that this CDM project will not export electricity higher than 1MW as also described in the registered PDD respectively. The response from the PP was found adequate and satisfactory, so **CAR#16 was closed out.**

It was further validated that the name of the PP is not in line with the registered PDD. The validation team has checked the project web link (<http://cdm.unfccc.int/Projects/DB/DNV-CUK1194442031.0/view>) and found that the PP has revised the MOC to update the name and contact details. Further details are shown in Annex 2 (Change/update authorized signatory, name or contact details) valid as of 24/09/2012. The validation team has again checked the Modalities of Communication as available on and found that the new MOC has been updated and information is found consistent with the Annex 2 and the revised PDD. The PP has also provided the revised MOC with authorized signatory for cross validating. The validation team has checked and confirmed that this information is correct and satisfied.

3.2.4.1 Validation of the changes from the registered PDD

3.2.4.1.1 Additionality of the project activity

According to an increase of installed capacity of the gas generator set from the registered PDD, it causes 0.1 MW change in the project activity. Investment analysis was not selected in the additionality demonstration of the project activity. Only barrier analysis was selected, which are barriers due to prevailing practice, investment barriers and technological barrier (Tool for the demonstration and assessment of additionality, version 03) has been done. As 0.1 MW increasing in an installed capacity, EB 70 Annex 3 paragraph 223 is required to explain the reasons why the barriers are still valid. The explanations are as followings:

Barriers due to prevailing practice

According to the registered PDD, the project activity is the first commercial LFG collection/ utilization project in Thailand. There is also no regulation for LFG collection/utilization in Thailand hence LFG generated from the landfill site will be directly emitted to the atmosphere. It is fact that this project is the first commercial LFG project in Thailand so the increase of installed capacity does not affect this barrier.

Investment barriers

Thai local bank has rejected the loan for this project at the time of project conceptualise because perceived risks were too high. This barrier cannot be eliminated by increasing the installed capacity of gas generator from 1MW to 1.1MW. The revenue from the project activity is limited to a maximum of 1MW electricity exported to the grid as per the power purchase agreement of JS and MEA.

Technological barrier

Lack of available technology and experience to implementing project activity is the main argument to demonstrate additionality as technological barrier. As the project activity perceived high risk of the proper technology to be used, this project is the first of its kind in Thailand to utilize the LFG captured from landfill site for electricity purpose. Hence the risk of technological failure is not mitigated by increasing capacity of gas generator set.

In summary, it is obviously found that the change installed capacity of gas generator (Installed in the project activity at 1.1 MW but registered PDD is 1 MW) has not affected to barrier due to prevailing practice, the investment barrier and technological barrier which demonstrated the additionality in the registered PDD as there is no linkage between the additional installed capacity and its barrier. This confirms that this change is not affected to projects additionality.

3.2.4.1.2 Scale of CDM project activity

The project activity is large scale as per the original registered PDD. According to the revised PDD, there is no change in scale and project activity still remains as large scale.

3.2.4.1.3 Applicability and application of the Applied Approved Baseline Methodology

Even though there is an increase in the installed capacity of landfill gas generator, the project activity is still in accordance with the applicability criteria of the applied methodology ACM0001 version 5. The landfill gas is the partial or total atmospheric release in the baseline scenario whereas, in the project scenario, it is captured and used to generate electricity and flare. The emission reductions are also claimed for electricity generation which is exported to the grid. The AMS-I.D version 11 is applied to the project activity as increasing of the install capacity of generator (from 1MW to 1.1MW) is still less than 15MW. This conforms to the situation a) and c) of ACM0001 version 5. The discussion is also stated in section 3.1 of this report.

3.2.4.1.4 The compliance of the monitoring plan with applied monitoring methodology

Even though there is an increase in the installed capacity of landfill gas generator, the project activity is still in accordance with the monitoring plan of the applied methodology ACM0001 version 5. No revision has been made to the monitoring plan of project activity.

3.2.4.1.5 The level of accuracy of the monitoring compared with the requirements contained in the registered monitoring plan.

Even though there is an increase in the installed capacity of landfill gas generator, the project activity is still in accordance with the monitoring plan of the registered monitoring plan. No revision has been made to the accuracy of the monitoring of registered monitoring plan.

CAR#17 was raised regarding the incomplete comment received from UNFCCC. As there is the increase in the installed capacity so the emission reduction estimation of project activity has to be affected particularly with the quantity of electricity to be generated and its efficiency.

In the response, the PP has replied that there is change (increasing of install capacity) in the generator installed at the project site comparing to the project design mentioned in the registered PDD (project activity is registered on 14/08/2008, <http://cdm.unfccc.int/Projects/DB/DNV-CUK1194442031.0/view>). However, the generator is the same one that was purchased and installed at the first implementation of this project since 11/08/2005^{23/31/}. The assessment has checked against various supporting documents and found reliable. Thus, this is change to project design as per CDM PS (EB70 Annex2).

The increasing in the installed capacity of generator from 1.0MW to 1.1MW has an impact in estimation of the emission reductions. Different values of those actual input values relevant to determination of emission reduction are summarized herewith.

No.	Parameter	Values in the registered PDD ^{9/}	Value in the revised PDD ^{1/}
1	Installed capacity of generator	1,000 kW	1,100 kW
		Justification: This is reference to the project description that explain in the registered PDD and actual implementation of project activity observed on site.	
2	Gross electricity output	900 kW	1,100 kW
		Justification: There is no any explanation about this figure neither in the validation report nor in the registered spreadsheet. Thus, the assessment team has validated against the specification of electricity generator ^{29/} (i.e. at full load and 0.8 p.f.) and found consistent. Hence it is acceptable.	
3	Auxiliary electricity consumption (included both project activity and generator itself)	3.56 kW	109.9 kW
		Justification: This is accepted based on the confirmation from the technology supplier for the auxiliary load in generator ^{36/} (i.e 38.26 kW) and the confirmation from the PP in the auxiliary devices installed in project site ^{35/} (i.e 71.64 kW).	
4	Net electricity generated from project activity	896.44 kW	990.1 kW
		Justification: This parameter is calculated from the difference between gross electricity output and Auxiliary electricity consumption	
5	Power generation efficiency	45.5%	36.65%
		Justification: Although the generator is the same that was purchased and installed since the project activity has started its implementation. There is no any justification on the reference source of this efficiency in neither the registered PDD nor the validation report. Hence, the assessment team has requested the documented evidence to confirm the correctness of this figure. The PP has substantiated the technical specification and has revised this figure in both the PDD and the calculation spreadsheet. The parameter is calculated from the gross electricity output (i.e. 1,100 kW) and heat input at 100% load (i.e. 3,001 kW) as per specification of electricity generator ^{29/} . This has been checked and found consistent, hence it is acceptable.	
6	Operating hour per year	8,000 hrs/yr	8,000 hrs/yr
		Justification: Similar to the above parameter (power generation efficiency), the assessment team required to validate the correctness of this figure as there is no any reference provided in registered PDD ^{9/} . The assumption of annual operating hour is as per the operation and maintenance manual ^{34/} . This has been checked with documentary evidence and found consistent with that mentioned in the registered PDD, hence it is acceptable.	
7	LFG to be consumed	2,970,003 m ₃ CH ₄ /yr	4,055,898 m ₃ CH ₄ /yr

	by the generator	Justification: This is obtained from back calculation from the energy efficiency of power generator and the maximum electricity generation with one year operating hour.	
8	LFG to be flared	9,699,145 m ³ CH ₄ /yr	8,613,250 m ³ CH ₄ /yr
		Justification: This parameter is calculated from the difference between the total LFG captured and LFG required for electricity generation (based on the data in year 2008).	

Increase in the installed capacity of the generator affects the specification of the generator and other parameter require for emission reduction calculation as below,

1. Changes in the electricity generating efficiency, in this project activity the electricity generating efficiency is decreasing.
2. Increase in the gross electricity output
3. Increase in the auxiliary electricity consumption
4. Increase in the net electricity generated from project activity, this resulted due to an increase in the baseline emission from a higher amount of electricity supplied to displace grid electricity
5. Increase in the LFG being consumed by the generator, this resulted due to an increase in the baseline emissions from methane destruction. Also, the increase of the LFG consuming in the generator will increase the baseline emission from the methane destruction efficiency.
6. Decrease in the LFG to be flared, this resulted due to decreasing the baseline emissions from methane destruction.

The PP has re-calculated the emission reductions of the project activity using the installation capacity 1.1MW. However, the change (i.e. increasing in the installed capacity) has no effect to the landfill gas generation and no any changes have been made to the characteristic of waste and design of the landfill. Hence, the quantity of landfill gas remains the same as estimated in the annex 3 of registered PDD. Comparison of the emission reduction estimated in the registered PDD and the revised PDD is as presented in the below table.

Year	ER in the registered PDD ^{9/} (tCO ₂ e)	ER in the revised PDD ^{1/} (tCO ₂ e)
2008	71,503	76,587
2009	63,844	68,928
2010	57,252	62,336
2011	51,578	56,662
2012	46,695	51,778
2013	42,492	47,575
2014	38,874	43,957
2015	35,760	40,843
2016	33,080	37,124
2017	30,773	32,515
Average	47,185	51,830

The average 10 years ex-ante emission reduction of project activity in the revised PDD is approximately 9.84% higher than the registered PDD^{9/} (i.e from 47,185 tCO₂e to 51,830 tCO₂e). The justifications on the significant increase are based on the difference in emission reductions which primarily comes from (1) the increasing in net annual electricity generation and (2) destruction of methane which depends on destruction efficiency of each system (i.e. generator and flare).

Increasing in net annual electricity generation

- The increasing of installed capacity of generator results in the increasing of electricity produce which will be displacing grid electricity (increasing in the value of parameter “EL_y”). So, the emission reduction increases accordingly.

Destruction of methane which depends on destruction efficiency of each system

- As explained in paragraph above, the quantity of landfill gas remains the same as estimated in the registered PDD. However, increasing of the installed capacity of generator reflects in increasing of the quantity LFG to be utilized in the generator (increasing in the value of parameter “MD_{electricity}”) and reducing of the quantity of LFG to be flared (decreasing in the value of parameter “MD_{flare}”). In addition, methane destruction efficiency for flaring is only 50% which is lower than the efficiency at 100% when LFG is combusted in the generator. So this is increase in the value of parameter “MD_{project}” for baseline emission from methane destruction.

The revised ER calculation sheet^{/2/} has been also checked for the steps taken and equations applied to calculate project emissions, baseline emissions, leakage and emission reductions. From the outcome, these are complied with the requirements of the selected baseline and monitoring methodology as per applied methodology ACM0001 version 5, the assessment team has checked the requirements of VVS version 3 (EB70 Annex3) paragraph 99 and confirmed as below.

- All assumptions and data used by the project participants are listed in the PDD, including their references and sources;
- All documentation used by project participants as the basis for assumptions and sources of data is correctly quoted and interpreted in the PDD;
- All values used in the PDD are considered reasonable in the context of the proposed CDM project activity;
- The baseline methodology of ACM0001 version 5 has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions (leakage in this project activity is not applicable);
- All estimates of the baseline emissions are transparent and able to be replicated using the data and parameter values provided in the PDD.

In conclusion, the assessment team has an opinion that the requirements of VVS version 3 paragraph 99 are met and found to be satisfactory hence **CAR#17 was closed out**.

3.2.5 Changes to start date of crediting period

Not applicable.

3.3 Remaining Issues, CAR's, FAR's from Previous Validation or Verification

Not applicable. The validation of this project activity has been done by DNV (<http://cdm.unfccc.int/UserManagement/FileStorage/OSLD60SUJ8NO4Y0FA1087Q6X45FYX3>). There are no pending issues from validation^{/10/}. This is the first verification period of the project activity hence no any other remaining issues from the previous verification.

3.4 Compliance of the monitoring plan with the monitoring methodology.

The monitoring plan of the registered project is in accordance with the applied methodology^{/11/}.

Below are the tables to validate on the compliance of the monitoring plan of each parameter to be monitored in the registered PDD and the approved monitoring plan as per applied methodology (i.e. ACM0001 version 5)

Registered PDD Approved Methodology	Requirement in the applicable methodology and relevant EB documents	Requirement in the registered monitoring plan	Conclusion on the compliance of the monitoring plan in the PDD with the methodology
Data/Parameter	LFG _{total,y} (m ³)	LFG _{total,y} (m ³)	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Description	Total amount of landfill gas captured	Total amount of landfill gas captured	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measured/Calculated /Default	Measured	Measured	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Source of data	N/A	On-site measurements	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Monitoring equipment	Measured by a flow meter	Measured by a flow meter	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measuring/Reading/Recording frequency	Measured continuously/periodically Data to be aggregated monthly and yearly	Measured continuously Data to be aggregated monthly and yearly	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	Flow meter should be subject to a regular maintenance and testing regime to ensure accuracy.	Flow meter will be subject to a regular maintenance and testing regime to ensure accuracy.	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.

Registered PDD Approved Methodology	Requirement in the applicable methodology and relevant EB documents	Requirement in the registered monitoring plan	Conclusion on the compliance of the monitoring plan in the PDD with the methodology
Data/Parameter	LFG _{flare,y} (m ³)	LFG _{flare,y} (m ³)	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Description	Amount of landfill gas flared	Amount of landfill gas flared	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measured/Calculated /Default	Measured	Measured	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Source of data	N/A	On-site measurements	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Monitoring equipment	Measured by a flow meter	Measured by a flow meter	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measuring/Reading/Recording frequency	Measured continuously/periodically Data to be aggregated monthly and yearly	Measured continuously Data to be aggregated monthly and yearly	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	Flow meter should be subject to a regular maintenance and testing regime to ensure accuracy.	Flow meter will be subject to a regular maintenance and testing regime to ensure accuracy.	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.

Registered PDD Approved Methodology	Requirement in the applicable methodology and relevant EB documents	Requirement in the registered monitoring plan	Conclusion on the compliance of the monitoring plan in the PDD with the methodology
Data/Parameter	LFG _{electricity,y} (m ³)	LFG _{electricity,y} (m ³)	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Description	Amount of landfill gas combusted in power plant	Amount of landfill gas combusted in power plant	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measured/Calculated /Default	Measured	Measured	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.

			methodology.
Source of data	N/A	On-site measurements	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Monitoring equipment	Measured by a flow meter	Measured by a flow meter	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measuring/Reading/Recording frequency	Measured continuously/periodically Data to be aggregated monthly and yearly	Measured continuously Data to be aggregated monthly and yearly	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	Flow meter should be subject to a regular maintenance and testing regime to ensure accuracy.	Flow meter will be subject to a regular maintenance and testing regime to ensure accuracy.	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.

Registered PDD Approved Methodology	Requirement in the applicable methodology and relevant EB documents	Requirement in the registered monitoring plan	Conclusion on the compliance of the monitoring plan in the PDD with the methodology
Data/Parameter	PE _{flare,y} (tCO ₂ e)	PE _{flare,y} (tCO ₂ e)	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Description	Project emission from flaring of the residual gas stream in year y	Project emission from flaring of the residual gas stream in year y	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measured/Calculated /Default	Measured / Calculated	Measured / Calculated	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Source of data	N/A	On-site measurements and calculation	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Monitoring equipment	Should be monitored as per the "Tool to determine project emissions from flaring gases containing Methane"	Will be monitored as per the "Tool to determine project emissions from flaring gases containing Methane"	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measuring/Reading/Recording frequency	Should be monitored as per the "Tool to determine project emissions from flaring gases containing Methane"	Will be monitored as per the "Tool to determine project emissions from flaring gases containing Methane"	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Calculation method (if applicable)	N/A	N/A	N/A

QA/QC procedures	N/A	N/A	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
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Approved Methodology / Registered PDD	Requirement in the applicable methodology and relevant EB documents	Requirement in the registered monitoring plan	Conclusion on the compliance of the monitoring plan in the PDD with the methodology
Data/Parameter	$w_{CH_4,y}$ (m^3CH_4 / m^3LFG)	$w_{CH_4,y}$ (m^3CH_4 / m^3LFG)	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Description	Methane fraction in the landfill gas	Methane fraction in the landfill gas	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measured/Calculated /Default	Measured	Measured	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Source of data	N/A	On-site measurements	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Monitoring equipment	Preferably measured by continuous gas quality analyser. Methane fraction of the landfill gas to be measured on wet basis.	Before the open flare system is installed this parameter will be measured periodically using a portable gas analyser. After installation of the open flare system, this parameter will be measured continuously using a continuous gas analyser.	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measuring/Reading/Recording frequency	Measured continuously/periodically	Measured continuously Data to be aggregated monthly and yearly	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	The gas analyser should be subject to a regular maintenance and testing regime to ensure accuracy	Analysers will be periodically calibrated according to the manufacturer's recommendation. A zero check and a typical value check will be performed by comparison with a standard certified gas.	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.

Registered PDD Approved Methodology	Requirement in the applicable methodology and relevant EB documents	Requirement in the registered monitoring plan	Conclusion on the compliance of the monitoring plan in the PDD with the methodology
Data/Parameter	T (°C)	T (°C)	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Description	Temperature of the landfill gas	Temperature of the landfill gas	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measured/Calculated /Default	Measured	Measured	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Source of data	N/A	On-site measurements	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Monitoring equipment	Measured to determine the density of methane D _{CH₄} No separate monitoring of temperature is necessary when using flow meters that automatically measure temperature and pressure, expressing LFG volumes in normalised cubic meter.	Measured to determine the density of methane D _{CH₄} using a thermocouple	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measuring/Reading/ Recording frequency	Measured continuously/periodically	Measured periodically	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	N/A	N/A	N/A

Registered PDD Approved Methodology	Requirement in the applicable methodology and relevant EB documents	Requirement in the registered monitoring plan	Conclusion on the compliance of the monitoring plan in the PDD with the methodology
Data/Parameter	p (Pa)	p (Pa)	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Description	Pressure of the landfill gas	Pressure of the landfill gas	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measured/Calculated /Default	Measured	Measured	The monitoring plan described in the PDD's monitoring plan is

			in line with the applied methodology.
Source of data	N/A	On-site measurements	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Monitoring equipment	Measured to determine the density of methane D_{CH_4} No separate monitoring of pressure is necessary when using flow meters that automatically measure temperature and pressure, expressing LFG volumes in normalised cubic meter.	Measured to determine the density of methane D_{CH_4} using a pressure transmitter	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measuring/Reading/Recording frequency	Measured continuously/periodically	Measured periodically	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	N/A	N/A	N/A

Registered PDD Approved Methodology	Requirement in the applicable methodology and relevant EB documents	Requirement in the registered monitoring plan	Conclusion on the compliance of the monitoring plan in the PDD with the methodology
Data/Parameter	$EL_{EX,LFG}$ (MWh)	$EL_{EX,LFG}$ (MWh)	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Description	Total amount of electricity exported out of the project boundary	Total amount of electricity exported out of the project boundary	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measured/Calculated /Default	Measured	Measured	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Source of data	N/A	On-site measurements	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Monitoring equipment	N/A	Measured by using an electricity meter	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measuring/Reading/Recording frequency	Measured continuously	Measured continuously	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.

Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	N/A	Flow meter will be subject to a regular maintenance and testing regime to ensure accuracy. Amount of electricity exported will be double checked with receipt of sale.	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.

Registered PDD Approved Methodology	Requirement in the applicable methodology and relevant EB documents	Requirement in the registered monitoring plan	Conclusion on the compliance of the monitoring plan in the PDD with the methodology
Data/Parameter	EL _{IMP} (MWh)	EL _{IMP} (MWh)	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Description	Total amount of electricity imported to meet project requirement	Total amount of electricity imported to meet project requirement	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measured/Calculated /Default	Measured	Measured	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Source of data	N/A	On-site measurements	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Monitoring equipment	N/A	Measured by using an electricity meter	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measuring/Reading/Recording frequency	Measured continuously	Measured continuously	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	The records of any electricity imported in the baseline too should be recorded at the start of project	The records of any electricity imported in the baseline too should be recorded at the start of project	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.

Registered PDD Approved Methodology	Requirement in the applicable methodology and relevant EB documents	Requirement in the registered monitoring plan	Conclusion on the compliance of the monitoring plan in the PDD with the methodology
Data/Parameter	ET _y (TJ)	ET _y (TJ)	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Description	Thermal energy used in landfill during project	Thermal energy used in landfill during project	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measured/Calculated /Default	Measured	Measured	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Source of data	N/A	On-site measurements	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Monitoring equipment	N/A	If fossil fuel is used, the quantity of fossil fuel used will be measured by using weight or volume meters.	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measuring/Reading/Recording frequency	Annually	N/A	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	The quantity of fossil fuel used to meet the energy requirements. If electricity is produce on site using fossil fuel, it is covered under this category. In project where LFG gas is captured in the baseline to either meet the regulation or for safety reason, fossil fuel used I the baseline too should be recorded.	It is not expected any thermal energy will be used for Project Activity. However, this variable will be measured.	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.

Registered PDD Approved Methodology	Requirement in the applicable methodology and relevant EB documents	Requirement in the registered monitoring plan	Conclusion on the compliance of the monitoring plan in the PDD with the methodology
Data/Parameter	CEF _{thermal} (tCO ₂ /TJ)	CEF _{thermal} (tCO ₂ /TJ)	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Description	CO ₂ emission intensity of the thermal energy	CO ₂ emission intensity of the thermal energy	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measured/Calculated /Default	Calculated	Calculated	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Source of data	N/A	Local data of NCV and/or IPCC default values	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Monitoring equipment	N/A	N/A	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measuring/Reading/Recording frequency	Annually	N/A	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Calculation method (if applicable)	N/A	If fossil fuel is used, CO ₂ emission intensity of the thermal energy will be calculated with local data of NCV and/or IPCC default values	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
QA/QC procedures	N/A	N/A	N/A

Registered PDD Approved Methodology	Requirement in the applicable methodology and relevant EB documents	Requirement in the registered monitoring plan	Conclusion on the compliance of the monitoring plan in the PDD with the methodology
Data/Parameter	(Test)	(Test)	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Description	Regulatory requirements relating to landfill gas projects	Regulatory requirements relating to landfill gas projects	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measured/Calculated /Default	N/A	N/A	N/A
Source of data	N/A	Local/national data	The monitoring plan described

			in the PDD's monitoring plan is in line with the applied methodology.
Monitoring equipment	N/A	N/A	N/A
Measuring/Reading/Recording frequency	At the renewal of crediting period	This information will be recorded annually	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology. However, this project activity is validated and registered with the fixed crediting period.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	The information though recorded annually, is used for change to the adjustment factor (AF) or directly $MD_{reg,y}$ at renewal of crediting period	N/A	N/A

Registered PDD Approved Methodology	Requirement in the applicable methodology and relevant EB documents	Requirement in the registered monitoring plan	Conclusion on the compliance of the monitoring plan in the PDD with the methodology
Data/Parameter	(Hours)	(Hours)	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Description	Operation of the energy plant	Operation of the energy plant	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Measured/Calculated /Default	Measured	Measured	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Source of data	N/A	On-site measurements	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Monitoring equipment	N/A	N/A	N/A
Measuring/Reading/Recording frequency	Recorded annually	Recorded annually	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	This is monitored to ensure methane destruction is claimed for methane used in electricity plant when it is operational	This is monitored to ensure methane destruction is claimed for methane used in electricity plant when it is operational	The monitoring plan described in the PDD's monitoring plan is in line with the applied methodology.

3.5 Completeness and accuracy of Monitoring

3.5.1 Verification of monitoring of parameters

Monitoring of reductions in GHG emissions resulting from the registered project have been implemented in accordance with the monitoring plan contained in the registered PDD^{9/} (web link: <http://cdm.unfccc.int/Projects/DB/DNV-CUK1194442031.0/view>). The monitoring mechanism, including the data collection system, is effective and reliable.

CL#04 was raised because there was no information towards how 1) total amount of electricity exported out of the project boundary and 2) total amount of gross electricity generation) can be cross-reference with documentary evidence to proof that data reported in the ER calculation sheet is correct and reliable. In response, the PP substantiated the electricity statements from MEA^{12/} for cross checking the total amount of electricity exported to MEA. The statement was checked and confirmed that data reported in ER calculation sheet is correct. The energy balance^{12/} was obtained to support the reported total amount of gross electricity generation. In comparison, the design specification and reported figures are less than 8% different by the major factor on methane concentration (Actual & Design Criteria). **CL#04 was closed** due to the energy balance of biogas utilization has been provided for cross checking and found reasonable.

In consequence with the Monitoring Report version 1^{4/}, the unit of biogas meters reported in monitoring spreadsheet (Nm³) was found inconsistent with the applied methodology and approved monitoring plan (m³). Hence, **CAR#9 was raised**. The PP clarified that there was a misunderstanding in the reporting unit of biogas volumetric flow, i.e. the unit previously presented as "Nm³" (normal cubic meter) in the monitoring spreadsheet was in fact already corrected to "m³" (cubic meter). The reported values are derived from measured values at the operating conditions multiply by the correction-factor as per its specification^{24/}. The correction-factor eliminates "error" that is occurred while a volumetric flow rate is measured at an "actual" operating pressure and temperature that vary from the "design" operating pressure and temperature of the monitoring devices. In addition, the standard temperature and pressure (STP) referred in ACM0001 version05 is 0 degree Celsius and 1.013 bar (equivalent to 101.3kPa, 1 atm.) whereas 15 degree celsius and 1.013 bar (equivalent to 101.3kPa, 1 atm.). The conversion of volumetric flow (Nm3) to STP causes the emission reduction decreased by 16% compare to previous calculation. The calculation of volumetric flow rate correction and the procedure to derive volumetric flow (Nm3) at STP were also provided as supporting evidence^{24/}. The Monitoring Report and calculation spreadsheet were revised and found satisfactory in the unit reporting, **CAR#09 was closed out**.

In addition, **CAR#12 was also raised** because all monitoring parameters did not report in the same unit as mentioned in the registered PDD. This has been summarized as below.

Parameter	Unit reported in the monitoring report version 1 ^{4/}	Unit mentioned in the registered PDD ^{9/}
Flow of LGF	Nm ³	m ³
Quantity of electricity exported	kWh	MWh
Temperature	K	Degree C

In response, the revised monitoring reported was submitted in which all units reported in the monitoring report^{1/} and calculation spreadsheet^{2/} were corrected consistent with the registered monitoring plan and applied methodology. **CAR#12 was closed out** due to all issue above has been corrected.

1. $LFG_{total,y}$ (m^3) : Total of landfill gas captured

Monitoring Report, onsite checks Registered Monitoring Plan & Approved Methodology	Requirement in the registered monitoring plan	Implementation of the project	Conclusion on the compliance of the implementation with the monitoring plan
Data/Parameter	$LFG_{total,y}$ (m^3)	$LFG_{total,y}$ (m^3)	The implementation is in compliance with the registered monitoring plan.
Description	Total amount of landfill gas captured	Total amount of landfill gas captured	The implementation is in compliance with the registered monitoring plan.
Measured/Calculated /Default	Measured	Measured	The implementation is in compliance with the registered monitoring plan.
Source of data	On-site measurements	On-site measurements	The implementation is in compliance with the registered monitoring plan.
Monitoring equipment	Measured by a flow meter	Measured by a flow meter.	The implementation is in compliance with the registered monitoring plan.
Measuring/Reading/ Recording frequency	Measured continuously Data to be aggregated monthly and yearly	As the flow meter installed in the project activity is measured on the flow rate of LFG on continuously (at every 5 seconds from 14/03/2008 until 04/08/2008 and every 1 minute from 05/08/2008 onward) in the unit of "m3/hr" Then the aggregation of the LFG volume have been done in hourly basis (in the unit of m3) for ER calculation.	The implementation is in compliance with the registered monitoring plan.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	Flow meter will be subject to a regular maintenance and testing regime to ensure accuracy.	Flow meter has been calibrated in yearly basis as per recommendation by the technology supplier.	The implementation is in compliance with the registered monitoring plan.

2. $LFG_{flare,y}$ (m^3) : Amount of landfill gas flared

Monitoring Report, onsite checks Registered Monitoring Plan & Approved Methodology	Requirement in the registered monitoring plan	Implementation of the project	Conclusion on the compliance of the implementation with the monitoring plan
Data/Parameter	$LFG_{flare,y}$ (m^3)	$LFG_{flare,y}$ (m^3)	The implementation is in compliance with the registered monitoring plan.
Description	Amount of landfill gas flared	Amount of landfill gas flared	The implementation is in compliance with the registered monitoring plan.
Measured/Calculated /Default	Measured	Measured	The implementation is in compliance with the registered monitoring plan.
Source of data	On-site measurements	On-site measurements	The implementation is in compliance with the registered monitoring plan.
Monitoring equipment	Measured by a flow meter	Measured by a flow meter.	The implementation is in compliance with the registered monitoring plan.
Measuring/Reading/ Recording frequency	Measured continuously Data to be aggregated monthly and yearly	As the flow meter installed in the project activity is measured on the flow rate of the LFG on continuously (at every 5 seconds from 14/03/2008 until 04/08/2008 and every 1 minute from 05/08/2008 onward) in the unit of "m3/hr" Then the aggregation of the LFG volume have been done in hourly basis (in the unit of m3) for ER calculation.	The implementation is in compliance with the registered monitoring plan.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	Flow meter will be subject to a regular maintenance and testing regime to ensure accuracy.	Flow meter has been calibrated in yearly basis as per recommendation by the technology supplier.	The implementation is in compliance with the registered monitoring plan.

3. LFG_{electricity.y} (m³) : Amount of landfill gas combusted in power plant

Monitoring Report, onsite checks Registered Monitoring Plan & Approved Methodology	Requirement in the registered monitoring plan	Implementation of the project	Conclusion on the compliance of the implementation with the monitoring plan
Data/Parameter	LFG _{electricity.y} (m ³)	LFG _{electricity.y} (m ³)	The implementation is in compliance with the registered monitoring plan.
Description	Amount of landfill gas combusted in power plant	Amount of landfill gas combusted in power plant	The implementation is in compliance with the registered monitoring plan.
Measured/Calculated /Default	Measured	Measured	The implementation is in compliance with the registered monitoring plan.
Source of data	On-site measurements	On-site measurements	The implementation is in compliance with the registered monitoring plan.
Monitoring equipment	Measured by a flow meter	Measured by a flow meter.	The implementation is in compliance with the registered monitoring plan.
Measuring/Reading/ Recording frequency	Measured continuously Data to be aggregated monthly and yearly	As the flow meter installed in the project activity is measured on the flow rate of the LFG on continuously (at every 5 seconds from 14/03/2008 until 04/08/2008 and every 1 minute from 05/08/2008 onward) in the unit of "m3/hr" Then the aggregation of the LFG volume have been done in hourly basis (in the unit of m3) for ER calculation.	The implementation is in compliance with the registered monitoring plan.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	Flow meter will be subject to a regular maintenance and testing regime to ensure accuracy.	Flow meter has been calibrated in yearly basis as per recommendation by the technology supplier.	The implementation is in compliance with the registered monitoring plan.

The reported data of LFG flow (i.e. Total amount of landfill gas captured, Amount of landfill gas flared and Amount of landfill gas combusted in power plant) have been verified with a summary report from SCADA system^{37/} then cross checked again with the plant log book^{38/} for the manual logging system. The assessment team also checked the maintenance record^{38/} which has been noted in the log book to ensure that the data reported are correct and reflect the actual implementation of the project activity especially during the period that monitoring device was not in order to measure the data or malfunction. In addition, the calibration plan and calibration record^{33/} of the biogas flow meter were also provided by the PP. These were checked and found satisfactory as no delay of calibration was observed. The amount of LFG has been measured every five seconds and adjusted to one minute intervals in the later stage^{16/}, then aggregated to hourly values for the emission reduction calculation. The emission reduction calculation sheet to report the values according to methodology ACM0001 version 5, default density of methane used for calculating is in the condition of 0 degree Celsius and 1.013 bar. However, the gas flow meter reports the biogas value in the

difference condition at 15 degree Celsius and 1.013 bar^{/39/}. This can be concluded that the monitoring of biogas (meter reading) is in the difference condition. Thus the PP has converted LFG unit in the same condition of the methodology (i.e. 0 degree Celsius and 1.013 bar) by using the standard conversion formulae "Van der Waals equation of state, $(PV/T = P_0V_0/T_0)$ ".

4. $PE_{\text{flare},y}$ (tCO₂e) : Project emission from flaring of the residual gas stream in year y

There are three parameters related to the equation to determine the project emission from flaring of the residual gas stream

- " $f_{v,i,h}$: Volumetric fraction of component i in the residual gas in hour h where $i = \text{CH}_4$ ", this parameter is same to parameter $w_{\text{CH}_4,y}$ ($\text{m}^3\text{CH}_4 / \text{m}^3\text{LFG}$) as the per the simplified approach of the Tool to determine project emissions from flaring gases containing Methane "As a simplified approach, project participants may only measure the methane content of the residual gas and consider the remaining part as N_2 ." Please see detail in parameter No.5 below.

- " $FV_{\text{RG},h}$ (m^3/h) : Volumetric flow rate of the residual gas in dry basis at normal condition in the hour h" this parameter is same to parameter $\text{LFG}_{\text{flare},y}$ (m^3) as the quantity of LFG sent to flare is measured continuously and aggregate on hourly basis . Please see detail in parameter No.2 above.

- "Flare operation parameter (min/h) : Minutes that flare is detected during the hour h"

Monitoring Report, onsite checks Registered Monitoring Plan & Approved Methodology	Requirement in the registered monitoring plan	Implementation of the project	Conclusion on the compliance of the implementation with the monitoring plan
Data/Parameter	$PE_{\text{flare},y}$ (tCO ₂ e)	$PE_{\text{flare},y}$ (tCO ₂ e)	The implementation is in compliance with the registered monitoring plan.
Description	Project emission from flaring of the residual gas stream in year y	Project emission from flaring of the residual gas stream in year y	The implementation is in compliance with the registered monitoring plan.
Measured/Calculated /Default	Measured / Calculated	Measured / Calculated	The implementation is in compliance with the registered monitoring plan.
Source of data	On-site measurements and calculation	Calculation from the on-site measurements data	The implementation is in compliance with the registered monitoring plan.
Monitoring equipment	Will be monitored as per the "Tool to determine project emissions from flaring gases containing Methane"	As per "Tool to determine project emissions from flaring gases containing Methane" there are three separate parameters to be used to determine project emission which are - $f_{v,i,h}$: Volumetric fraction of component i in the residual gas in hour h where $i = \text{CH}_4$ - $FV_{\text{RG},h}$ (m^3/h) : Volumetric flow rate of the residual gas in dry basis at normal condition in the hour h - Flare operation parameter (min/h) : Minutes that flare is	The implementation is in compliance with the registered monitoring plan.

		detected during the hour h	
Measuring/Reading/Recording frequency	Will be monitored as per the "Tool to determine project emissions from flaring gases containing Methane"	as per the "Tool to determine project emissions from flaring gases containing Methane"	The implementation is in compliance with the registered monitoring plan.
Calculation method (if applicable)	$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times (1 - \eta_{flare,h}) \times \frac{GWP_{CH4}}{1000}$ <p>And</p> $TM_{RG,h} = FV_{RG,h} \times fv_{CH4, RG,h} \times \rho_{CH4,n}$		The implementation is in compliance with the registered monitoring plan.
QA/QC procedures	N/A	N/A	N/A

4.1 Flare operation parameter (min/h)

Monitoring Report, onsite checks Registered Monitoring Plan & Approved Methodology	Requirement in the registered monitoring plan	Implementation of the project	Conclusion on the compliance of the implementation with the monitoring plan
Data/Parameter	(min/h)	(min/h)	The implementation is in compliance with the registered monitoring plan.
Description	Flare operation parameter	Flare operation parameter	The implementation is in compliance with the registered monitoring plan.
Measured/Calculated /Default	Measured	Measured	The implementation is in compliance with the registered monitoring plan.
Source of data	On-site measurements	On-site measurements	The implementation is in compliance with the registered monitoring plan.
Monitoring equipment	Using flame detector	As this project determines the flaring efficiency base on the default value approach hence the minutes of flame detected is the parameter to be monitored. Flame detector is used to determine the operation of flare.	The implementation is in compliance with the registered monitoring plan.
Measuring/Reading/Recording frequency	Measured continuously	Flame is continuously measured (at every 5 seconds from 14/03/2008 until 04/08/2008 and every 1 minute from 05/08/2008 onward) by flame detector	The implementation is in compliance with the registered monitoring plan.
Calculation method (if applicable)	N/A	N/A	N/A

QA/QC procedures	N/A	N/A	N/A
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Flame detector (model SF-102B, S/N 945011V) is used for monitoring the time of flaring which data is linked to the SCADA. Verification of the reported data with summary report from SCADA system was then cross checked again with plant log book for the manual logging system.

Checked the maintenance record^{/38/} listed in the log book that might be the situation that measurement device cannot produce the data and checked the verification plan and the record of the flame detector^{/33/}. However, the flare efficiency has been verified and found that flare efficiency is zero. Thus, the PP has not claimed any ER for landfill gas sent to flare.

5. $w_{CH_4,y}$ (m^3CH_4 / m^3LFG) : Methane fraction in the landfill gas

Monitoring Report, onsite checks Registered Monitoring Plan & Approved Methodology	Requirement in the registered monitoring plan	Implementation of the project	Conclusion on the compliance of the implementation with the monitoring plan
Data/Parameter	$w_{CH_4,y}$ (m^3CH_4 / m^3LFG)	$w_{CH_4,y}$ (m^3CH_4 / m^3LFG)	The implementation is in compliance with the registered monitoring plan.
Description	Methane fraction in the landfill gas	Methane fraction in the landfill gas	The implementation is in compliance with the registered monitoring plan.
Measured/Calculated /Default	Measured	Measured	The implementation is in compliance with the registered monitoring plan.
Source of data	On-site measurements	On-site measurements	The implementation is in compliance with the registered monitoring plan.
Monitoring equipment	Before the open flare system is installed, this parameter will be measured periodically using a portable gas analyser. After installation of the open flare system, this parameter will be measured continuously using a continuous gas analyser.	Measured by a continuous gas analyser	The implementation is in compliance with the registered monitoring plan.
Measuring/Reading/Recording frequency	Measured continuously Data to be aggregated monthly and yearly	Measured continuously (at every 5 seconds from 14/03/2008 until 04/08/2008 and every 1 minute from 05/08/2008 onward) Data is averaged in hourly basis to determine the emission reduction	The implementation is in compliance with the registered monitoring plan.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	Analysers will be periodically calibrated according to the manufacturer's recommendation. A zero check and a typical value check will	Gas analyser has been calibrated in yearly basis as per the recommendation from the technology supplier. Also the zero check with the standard	The implementation is in compliance with the registered monitoring plan.

	be performed by comparison with a standard certified gas.	gas is performed periodically to ensure the accuracy of measurement	
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Both parameters (i.e. $fv_{i,h}$: Volumetric fraction of component i in the residual gas in hour h where i = CH₄ and $w_{CH_4,y}$: Methane fraction in the landfill gas) are the same parameters for fraction of methane in the landfill gas or residual gas. Hence only one sampling point is appropriate for the justification because the monitored parameter of w_{CH_4} is also used for fv_{CH_4} in case this parameter is measured continuously using continuous gas analyser. The assessment has checked the correctness of data reported in the ER spreadsheet by verifying against the summary report from SCADA system^{/37/} and cross checked with the plant log book that is manual logging system. The percentage of methane has been measured every five second and adjusted to one minute interval then aggregated to hourly values for emission reduction calculation.

The assessment team has also checked the maintenance record^{/38/} which has been noted in the log book to see whether there was the situation that measurement device was not in place or was not producing the data. The calibration plan and calibration record^{/33/} of the fixed type methane gas analyzer has been received from the PP. The same has been checked and found that there is no gap in delay calibration. In addition, the PP also used the portable gas analyser for cross checking the methane content in case of high significant error found on site. This is found acceptable and satisfactorily.

6. T (°C): Temperature of the landfill gas

Monitoring Report, onsite checks Registered Monitoring Plan & Approved Methodology	Requirement in the registered monitoring plan	Implementation of the project	Conclusion on the compliance of the implementation with the monitoring plan
Data/Parameter	T (°C)	T (°C)	The implementation is in compliance with the registered monitoring plan.
Description	Temperature of the landfill gas	Temperature of the landfill gas	The implementation is in compliance with the registered monitoring plan.
Measured/Calculated /Default	Measured	Measured	The implementation is in compliance with the registered monitoring plan.
Source of data	On-site measurements	On-site measurements	The implementation is in compliance with the registered monitoring plan.
Monitoring equipment	Measured to determine the density of methane D_{CH_4} using a thermocouple	Even the volumetric flow meter installed in this project is normalised flow meter (at 15°C and 1 atm.) hence it is not requiring the separate monitoring on the temperature of LFG. But the PP decided to monitor temperature of gas in the pipeline for internal operation and system control purposes. This is found reasonable.	The implementation is in compliance with the registered monitoring plan.
Measuring/Reading/Recording frequency	Measured periodically	The thermo couples are installed in the system at the point of LFG total and LFG electricity which are measured	The implementation is in compliance with the registered monitoring plan.

		continuously (every 5 seconds from 14/03/2008 until 04/08/2008 and every 1 minute from 05/08/2008 onward).	
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	N/A	This equipment is verified with standard reference in yearly basis. In case there is an error observed, this device has to be replaced with the new one (cannot be calibrated).	The implementation is in compliance with the registered monitoring plan.

The temperatures (with pressure measurement) are measuring the LFG characteristic as the compensate factor to the LFG flow meter which this factor will be automatically use by the system to express the amount of LFG in STP condition (i.e. 15° Celsius and 1 atm)^{/39/} in normalised flow meter. Hence this parameter is not used for calculate the density of LFG. The reported data in the summary report from SCADA system^{/37/} was checked then cross checked against the plant log book^{/38/} for the manual logging system.

The maintenance record^{/38/} listed in the log book was checked in case there was the situation that the measurement device was not producing the data and the calibration plan and calibration record of the pressure and temperature transmitter^{/33/} were also checked These were found to be in line with those described in the monitoring plan in the registered PDD.

7. p (Pa) : Pressure of the landfill gas

Monitoring Report, onsite checks Registered Monitoring Plan & Approved Methodology	Requirement in the registered monitoring plan	Implementation of the project	Conclusion on the compliance of the implementation with the monitoring plan
Data/Parameter	p (Pa)	p (Pa)	The implementation is in compliance with the registered monitoring plan.
Description	Pressure of the landfill gas	Pressure of the landfill gas	The implementation is in compliance with the registered monitoring plan.
Measured/Calculated /Default	Measured	Measured	The implementation is in compliance with the registered monitoring plan.
Source of data	On-site measurements	On-site measurements	The implementation is in compliance with the registered monitoring plan.
Monitoring equipment	Measured to determine the density of methane D _{CH4} using a pressure transmitter	Even the volumetric flow meter installed in this project is normalised flow meter (at 15°C and 1 atm.) hence it is not requiring the separate monitoring on the pressure of LFG. The PP decided to monitor pressure of gas in the pipeline for internal operation and system control purposes.	The implementation is in compliance with the registered monitoring plan.

		This is found reasonable.	
Measuring/Reading/Recording frequency	Measured periodically	The pressure transmitters are installed in the system at the point of LFG total and LFG electricity which are measured continuously (every 5 seconds from 14/03/2008 until 04/08/2008 and every 1 minute from 05/08/2008 onward).	The implementation is in compliance with the registered monitoring plan.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	N/A	This equipment is verified with standard reference in yearly basis. In case there is an error observed, this device has to be replaced with the new one (cannot be calibrated).	The implementation is in compliance with the registered monitoring plan.

The pressures (with temperature measurement) are measuring the LFG characteristic as the compensate factor to the LFG flow meter which this factor will be automatically use by the system to express the amount of LFG in STP condition (i.e. 15° Celsius and 1 atm)^{/39/} in normalised flow meter. Hence this parameter is not used for calculate the density of LFG. The reported data in the summary report from SCADA system^{/37/} was checked then cross checked against the plant log book^{/38/} for the manual logging system.

The maintenance record^{/38/} listed in the log book was checked in case there was the situation that the measurement device was not producing the data and the calibration plan and calibration record of the pressure and temperature transmitter^{/33/} were also checked. These were found to be in line with those described in the monitoring plan in the registered PDD.

8. $EL_{EX,LFG}$ (MWh) : Total amount of electricity exported out if the project boundary

Monitoring Report, onsite checks Registered Monitoring Plan & Approved Methodology	Requirement in the registered monitoring plan	Implementation of the project	Conclusion on the compliance of the implementation with the monitoring plan
Data/Parameter	$EL_{EX,LFG}$ (MWh)	$EL_{EX,LFG}$ (MWh)	The implementation is in compliance with the registered monitoring plan.
Description	Total amount of electricity exported out of the project boundary	Total amount of electricity exported out of the project boundary	The implementation is in compliance with the registered monitoring plan.
Measured/Calculated /Default	Measured	Measured	The implementation is in compliance with the registered monitoring plan.
Source of data	On-site measurements	On-site measurements	The implementation is in compliance with the registered monitoring plan.
Monitoring equipment	Measured by using an electricity meter	Measured by using an electricity meter belongs to MEA (this meter can read both the imported and exported	The implementation is in compliance with the registered monitoring plan.

		electricity to the grid). The amount read from the meter is also cross check with the electricity statement which generated in monthly basis for commercial purpose.	
Measuring/Reading/Recording frequency	Measured continuously	Measured continuously	The implementation is in compliance with the registered monitoring plan.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	Flow meter will be subject to a regular maintenance and testing regime to ensure accuracy. Amount of electricity exported will be double checked with receipt of sale.	The meter is subject to regular maintenance and testing regime to ensure accuracy as per MEA requirement Note that the power meter is belonging to MEA hence it is out of control by the project participant.	The implementation is in compliance with the registered monitoring plan.

The data is filled out to be consistent with the data recorded in the daily plant records and have been verified by cross checking the implementation at the site and were found to be satisfactory.

The meters of Metropolitan Electricity Authority (MEA) for quantifying the electricity exported to the grid and imported for site consumption. Electricity consumptions are reported in the invoicing and purchasing statements^{127/} that has been used as cross-reference by using the daily plant log sheet as supporting documents.

9. EL_{IMP} (MWh) : Total amount of electricity imported to meet project requirement

Monitoring Report, onsite checks Registered Monitoring Plan & Approved Methodology	Requirement in the registered monitoring plan	Implementation of the project	Conclusion on the implementation with the monitoring plan
Data/Parameter	EL_{IMP} (MWh)	EL_{IMP} (MWh)	The implementation is in compliance with the registered monitoring plan.
Description	Total amount of electricity imported to meet project requirement	Total amount of electricity imported to meet project requirement	The implementation is in compliance with the registered monitoring plan.
Measured/Calculated /Default	Measured	Measured	The implementation is in compliance with the registered monitoring plan.
Source of data	On-site measurements	On-site measurements	The implementation is in compliance with the registered monitoring plan.
Monitoring equipment	Measured by using an electricity meter	Measured by using an electricity meter belongs to MEA (this meter can read both the imported and exported electricity to the grid).	The implementation is in compliance with the registered monitoring plan.

		The amount read from the meter is also cross check with the electricity statement which generated in monthly basis for commercial purpose.	
Measuring/Reading/Recording frequency	Measured continuously	Measured continuously	The implementation is in compliance with the registered monitoring plan.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	The records of any electricity imported in the baseline too should be recorded at the start of project	The meter is subject to regular maintenance and testing regime to ensure accuracy as per MEA requirement Note that the power meter is belonging to MEA hence it is out of control by the project participant.	The implementation is in compliance with the registered monitoring plan.

10. ET_y (TJ) : Thermal energy used in landfill during project

Monitoring Report, onsite checks Registered Monitoring Plan & Approved Methodology	Requirement in the registered monitoring plan	Implementation of the project	Conclusion on the compliance of the implementation with the monitoring plan
Data/Parameter	ET_y (TJ)	ET_y (TJ)	The implementation is in compliance with the registered monitoring plan.
Description	Thermal energy used in landfill during project	Thermal energy used in landfill during project	The implementation is in compliance with the registered monitoring plan.
Measured/Calculated /Default	Measured	Measured	The implementation is in compliance with the registered monitoring plan.
Source of data	On-site measurements	On-site measurements	The implementation is in compliance with the registered monitoring plan.
Monitoring equipment	If fossil fuel is used, the quantity of fossil fuel used will be measured by using weight or volume meters.	There is no thermal energy has been generated from and/or imported to project activity during this monitoring period. Hence, there is no value adopted for this parameter.	N/A
Measuring/Reading/Recording frequency	N/A	N/A	N/A
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	It is not expected any thermal energy will be used for Project Activity. However, this variable	No any thermal energy consumed for project activity.	The implementation is in compliance with the registered

	will be measured.		monitoring plan.
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11. $CEF_{thermal}$ (tCO₂/TJ) : CO₂ emission intensity of the thermal energy

Monitoring Report, onsite checks Registered Monitoring Plan & Approved Methodology	Requirement in the registered monitoring plan	Implementation of the project	Conclusion on the compliance of the implementation with the monitoring plan
Data/Parameter	$CEF_{thermal}$ (tCO ₂ /TJ)	$CEF_{thermal}$ (tCO ₂ /TJ)	The implementation is in compliance with the registered monitoring plan.
Description	CO ₂ emission intensity of the thermal energy	CO ₂ emission intensity of the thermal energy	The implementation is in compliance with the registered monitoring plan.
Measured/Calculated /Default	Calculated	Calculated	The implementation is in compliance with the registered monitoring plan.
Source of data	Local data of NCV and/or IPCC default values	Local data of NCV and/or IPCC default values	The implementation is in compliance with the registered monitoring plan.
Monitoring equipment	N/A	N/A	N/A
Measuring/Reading/ Recording frequency	N/A	N/A	N/A
Calculation method (if applicable)	If fossil fuel is used, CO ₂ emission intensity of the thermal energy will be calculated with local data of NCV and/or IPCC default values	There is no thermal energy has been generated from and/or imported to project activity during this monitoring period. Hence, there is no value adopted for this parameter.	The implementation is in compliance with the registered monitoring plan.
QA/QC procedures	N/A	N/A	N/A

Both parameters ("Thermal energy used in landfill during project (ET_y)" and "CO₂ emission intensity of the thermal energy ($CEF_{thermal,y}$)") are not applicable to this monitoring period because no thermal energy was used/generated in the project activity during the monitoring period. This has been checked during the site visit, was found reliable and therefore accepted.

12. Regulatory requirements relating to landfill gas projects

Monitoring Report, onsite checks Registered Monitoring Plan & Approved Methodology	Requirement in the registered monitoring plan	Implementation of the project	Conclusion on the compliance of the implementation with the monitoring plan
Data/Parameter	(Test)	(Test)	The implementation is in compliance with the registered monitoring plan.
Description	Regulatory requirements relating to landfill gas projects	Regulatory requirements relating to landfill gas projects	The implementation is in compliance with the registered monitoring plan.
Measured/Calculated /Default	N/A	N/A	N/A
Source of data	Local/national data	Local/national data	The implementation is in compliance with the registered monitoring plan.
Monitoring equipment	N/A	N/A	N/A
Measuring/Reading/ Recording frequency	This information will be recorded annually	This information will be recorded annually. The laws and regulations are being monitored every year and incorporated in the internal procedures of project participant. However, during this monitoring period, there is no requirement for the collection and utilization of LFG under Thailand's waste management regulations.	The implementation is in compliance with the registered monitoring plan.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	N/A	The assessment team has checked the publicly available website of Thailand government (www.diw.go.th) and www.pcd.go.th) and found this to be consistent.	The implementation is in compliance with the registered monitoring plan.

13. Operation of the energy plant (Hours)

Monitoring Report, onsite checks Registered Monitoring Plan & Approved Methodology	Requirement in the registered monitoring plan	Implementation of the project	Conclusion on the compliance of the implementation with the monitoring plan
Data/Parameter	(Hours)	(Hours)	The implementation is in compliance with the registered monitoring plan.
Description	Operation of the energy plant	Operation of the energy plant	The implementation is in compliance with the registered monitoring plan.
Measured/Calculated /Default	Measured	Measured	The implementation is in compliance with the registered monitoring plan.
Source of data	On-site measurements	On-site measurements	The implementation is in compliance with the registered monitoring plan.
Monitoring equipment	N/A	Count by analogue gauge at the panel of electricity generator set.	The implementation is in compliance with the registered monitoring plan.
Measuring/Reading/Recording frequency	Recorded annually	Recorded annually, however the analogue gauge is measured continuously.	The implementation is in compliance with the registered monitoring plan.
Calculation method (if applicable)	N/A	N/A	N/A
QA/QC procedures	This is monitored to ensure methane destruction is claimed for methane used in electricity plant when it is operational	This is monitored to ensure methane destruction is claimed for methane used in electricity plant when it is operational. The cross reference on the operating hour of project activity is checked against the plant record which found consistent.	The implementation is in compliance with the registered monitoring plan.

The operating hour is directly recorded by the cumulative analogue gauge. This gauge is installed as a part of the power generation unit. The operation gauge is used for counting operation hour of the energy plant when power generation unit is on. The daily plant log sheet has been verified by checking the operating hours; also the maximum operating hours in each month has been cross-checked by the total hours in a month. This was found to be satisfactory.

3.5.2 Verification of implementation of sampling plan

The implementation of sampling plan is not applicable as 100% data verification was done.

3.6 Accuracy of Equipment

The reporting procedures reflect the content of the monitoring plan. The monitoring is effective and reliable. The monitoring results are consistently recorded as per the frequency and the QA/QC procedures are followed as defined in the monitoring plan of the project activity. The monitoring instruments have been

calibrated as per the recommendation by the manufacturer and the details are described in the above section 3.5.1 of the verification report.

CAR#06 was raised because the monitoring equipments which mentioned in the Monitoring Report were not matching with the list of monitoring equipment and equipments installed on site as summarized in below table.

Monitoring Equipment	Monitoring Report version 1 ^{/4/}	List of Monitoring Equipments and Equipment Installed ^{/15/}
Gas Flow Transmitter No.1 (FL-01)	S/N: N1 – U013-959905	S/N: N1- T110-9491336
Gas Flow Transmitter No.3 (FL-03)	S/N: N1- T110-9491336 Max Measurement range : 800	S/N: N1 – U013-959905 Max Measurement range : 1,000
Temperature Controller (TE-03)	SN: T08151/PT08113	SN: T08151/PT08133
Pressure Transmitter (PR-01&03)	Model: ADZ-SML-10.0-1	Model: ADZ-SML-10.0
Pressure Transmitter (PR03)	Reference : III	Reference : VIII

CAR#06 was closed because the mismatching information has been corrected to consistent with the S/N of monitoring devices reported in the revised monitoring report^{/3/}.

Monitoring equipment	Flow Meter
Monitoring parameter	LFG _{total,y} (m ³) : Total of landfill gas captured
S/N	N1U0139599904
Type	Volumetric flow meter : different pressure transmitter Brand/Manufacturer : SIEMENS Model : Verabar V100/7MF4433-1BA22-146-Z
Level	Measuring range from 0 – 1,200 m ³ /hr, Accuracy class at 0.075%
Calibration frequency requirement	Recommend annually
Calibration date	1. On 15/08/2007 (Certificate No.RKT-0709036) and 2. On 02/08/2008 (Certificate No. P08/0238C)
Validity	One year
Are there delays in calibration?	No
Calibration Entity	1. Rockertek (Thailand) Co.,Ltd. and 2. ISOCAL Technology Co.,Ltd.
Accreditation Certificate for the calibration entity	1. Reference standard - Beamex : traceable to The National Institute of Metrology ,Thailand (NIMT) and Thai Airways International PLC. 2. Reference standard - Pressure calibrator ; traceable to The National Institute of Metrology ,Thailand (NIMT)

Monitoring equipment	Flow Meter
Monitoring parameter	LFG _{flare,y} (m ³) : Amount of landfill gas flared
S/N	N1T1109491336
Type	Volumetric flow meter : different pressure transmitter Brand/Manufacturer : SIEMENS Model : Verabar V100/7MF4433-1BA22-146-Z
Level	Measuring range from 0 – 1,200 m ³ /hr, Accuracy class at 0.075%
Calibration frequency requirement	Recommend annually
Calibration date	1. On 26/09/2007 (Certificate No. RKT-0709038) and 2. On 18/09/2008 (Certificate No. RKT-0809045)
Validity	One year
Are there delays in calibration?	No
Calibration Entity	1.&2.by Rockertek (Thailand) Co.,Ltd.
Accreditation Certificate for the calibration entity	1. Reference standard - Beamex : traceable to The National Institute of Metrology ,Thailand (NIMT) 2. Reference standard - Beamex : traceable to Thai Airways International PLC and NEC Corporation (Thailand) Ltd.

Monitoring equipment	Flow Meter
Monitoring parameter	LFG _{electricity,y} (m ³) : Amount of landfill gas combusted in power plant
S/N	N1U0139599905
Type	Volumetric flow meter : different pressure transmitter Brand/Manufacturer : SIEMENS Model : Verabar V100/7MF4433-1BA22-146-Z
Level	Measuring range from 0 – 1,200 m ³ /hr, Accuracy class at 0.075%
Calibration frequency requirement	Recommend annually
Calibration date	1. On 26/09/2007 (Certificate No. RKT-0709037) and 2. On 18/09/2008 (Certificate No. RKT-0809044)
Validity	One year
Are there delays in calibration?	No
Calibration Entity	1.&2.by Rockertek (Thailand) Co.,Ltd.
Accreditation Certificate for the calibration entity	1. Reference standard - Beamex : traceable to The National Institute of Metrology ,Thailand (NIMT) 2. Reference standard - Beamex : traceable to Thai Airways International PLC and NEC Corporation (Thailand) Ltd.

Monitoring equipment	Methane Gas Analyser
Monitoring parameter	w _{CH₄} (m ³ CH ₄ /m ³ LFG) : Methane fraction in the landfill gas
S/N	I-02253
Type	Fixed type gas analyser Brand/Manufacturer : Hitech Instruments Model : HITOX IR-600
Level	Measuring range from 0 – 100 %CH ₄ , Accuracy class at 2%
Calibration frequency requirement	Recommend annually
Calibration date	1. On 25/12/2007 (Certificate No. E080001) and 2. On 04/12/2008 (Certificate No. E080003)
Validity	One year
Are there delays in calibration?	No
Calibration Entity	1. & 2. Energy Solution Provider Co.,Ltd.
Accreditation Certificate for the calibration entity	Standard reference - Multimeter Fluke model : calibrated by Technology Promotion Association (Thailand - Japan)

Monitoring equipment	Thermocouple
Monitoring parameter	T (°C) : Temperature of the landfill gas (at the point of “total amount of LFG captured” is measured)
S/N	There are two devices used during this monitoring period 1. From 14/03/2008 – 21/07/2008 : T07216/PT07081 2. From 22/07/2008 – 31/12/2008 : T08151/PT08133
Type	Thermocouple and RTD with temperature controller Brand/Manufacturer : SHIMAX with FW System Model : Pt100N MAC3D-MCF-NN-NTN with FWP-7A-4.8x30 (S4)
Level	Measuring range from -50 – 400 °C, Accuracy class at 0.3%
Calibration frequency requirement	Recommend annually
Calibration date	For ; T07216/PT07081 On 18/10/2007 (Certificate No. T-0710080) For ; T08151/PT08133 On 22/07/2008 (Certificate No. T-0807154)
Validity	One year
Are there delays in calibration?	No
Calibration Entity	1. & 2. Technology Instruments Co.,Ltd.

Accreditation Certificate for the calibration entity	1. Reference standard <ul style="list-style-type: none"> - Platinum resistance thermometer : traceable to National Metrology Institute (NMI) - Process calibrator : traceable to National Measurement Laboratory (NML, Australia) and National Physical Laboratory (NPL, UK) - Thermometer : traceable to National Metrology Institute (NMI)
	2. Reference standard <ul style="list-style-type: none"> - Process calibrator : traceable to National Measurement Laboratory (NML, Australia) and National Physical Laboratory (NPL, UK) - Temperature calibrator : traceable to The National Institute of Metrology, Thailand (NIMT) - Temperature probe : traceable to The National Institute of Metrology, Thailand (NIMT)

Monitoring equipment	Thermocouple
Monitoring parameter	T (°C) : Temperature of the landfill gas (at the point of "amount of LFG combusted in power plant" is measured)
S/N	There are two devices used during this monitoring period 1. From 14/03/2008 – 29/12/2008 : T08003/PT08015 2. From 30/12/2008 – 31/12/2008 : T07216/PT07081
Type	Thermocouple and RTD with temperature controller Brand/Manufacturer : SHIMAX with FW System Model : Pt100N MAC3D-MCF-NN-NTN with FWP-7A-4.8x30 (S4)
Level	Measuring range from -50 – 400 °C, Accuracy class at 0.3%
Calibration frequency requirement	Recommend annually
Calibration date	For ; T08003/PT08015 On 10/01/2008 (Certificate No. T-0801059) For ; T07216/PT07081 On 30/12/2008 (Certificate No. T-08/0674C)
Validity	One year
Are there delays in calibration?	No
Calibration Entity	1. Technology Instruments Co.,Ltd. 2. ISOCAL Technology Co.,Ltd.
Accreditation Certificate for the calibration entity	1. Reference standard <ul style="list-style-type: none"> - Platinum resistance : traceable to and Physikalisch-Technische Bundesanstalt (PTB) - Process calibrator : traceable to National Metrology Laboratory, Australia (NML) and National Physical Laboratory, UK (NPL) - Thermometer : traceable to National Metrology Institute (NMI) 2. Reference standard <ul style="list-style-type: none"> - High precision bath : traceable to National Institute of Metrology, Thailand (NIMT) and National Measurement Institute, Australia (NMIA) - Digital multimeter : traceable to National Measurement Institute, Australia (NMIA) and national Institute of Standard and Technology, USA (NIST)

Monitoring equipment	Pressure Transmitter
Monitoring parameter	p (Pa) : Pressure of the landfill gas (at the point of "total amount of LFG captured" is measured)
S/N	There are two devices used during this monitoring period 1. From 14/03/2008 – 21/07/2008 : 1107030328 2. From 22/07/2008 – 31/12/2008 : 0702080001

Type	Pressure Transmitter Brand/Manufacturer : NAGANO Model : ADZ-SML-10.0
Level	Measuring range from -1 – 1 bar, Accuracy class at 0.5%
Calibration frequency requirement	Recommend annually
Calibration date	For ; 1107030328 1. On 03/08/2007 (Certificate No. CAL0069-07Q0077) For ; 0702080001 2. On 02/08/2008 (Certificate No. P08/0239)
Validity	One year
Are there delays in calibration?	No
Calibration Entity	1. Rockertek (Thailand) Co.,Ltd. 2. ISOCAL Technology Co.,Ltd.
Accreditation Certificate for the calibration entity	1. Reference standard - Beamex : traceable to Thai Airways International PLC and NEC Corporation (Thailand) Limited 2. Reference standard - Pressure calibrator : traceable to National Institute of Metrology, Thailand (NIMT)

Monitoring equipment	Pressure Transmitter
Monitoring parameter	p (Pa) : Pressure of the landfill gas (at the point of “amount of LFG combusted in power plant” is measured)
S/N	There are two devices used during this monitoring period 1. From 14/03/2008 – 29/12/2008 : 1107030324 2. From 30/12/2008 – 31/12/2008 : 1107030328
Type	Pressure Transmitter Brand/Manufacturer : NAGANO Model : ADZ-SML-10.0
Level	Measuring range from -1 – 1 bar, Accuracy class at 0.5%
Calibration frequency requirement	Recommend annually
Calibration date	For ; 1107030324 1. On 02/01/2008 (Certificate No. 08P2) For ; 1107030328 2. On 30/12/2008 (Certificate No. P08/0550C)
Validity	One year
Are there delays in calibration?	No
Calibration Entity	1. Technology Promotion Association (Thailand-Japan) 2. ISOCAL Technology Co.,Ltd.
Accreditation Certificate for the calibration entity	1. Reference standard - Pressure calibration : traceable to National Institute of Metrology, Thailand (NIMT) and Thai Airways International PLC. 2. Reference standard - Pressure calibrator : traceable to National Institute of Metrology, Thailand (NIMT)

Monitoring equipment	Electricity meter
Monitoring parameter	EL _{EX,LFG} (MWh) : Total amount of electricity exported out of project boundary and EL _{IMP} (MWh) : Total amount of electricity imported to meet project requirement
S/N	PK-201103 (This is meter along to MEA hence the serial number is adopted from electricity receipt)
Type	Electricity meter Brand/Manufacturer : ELSTER Model : A1RL+
Level	TOU meter with internal modem 3P/3wire , 5A, 120 V
Calibration frequency requirement	Periodically as per MEA's maintenance plan. This is out of control by Project Participant.
Calibration date	27/12/2007 (Certificate No. 1182/50) and on 12/06/2008 (this is refer to internal document of MEA, factory test)
Validity	N/A
Are there delays in calibration?	No
Calibration Entity	N/A
Accreditation Certificate for the calibration entity	N/A

Monitoring equipment	Flame detector
Monitoring parameter	Flare operation parameter (Minutes that flare is detected during the hour h)
S/N	945011V
Type	Flame detector (detect the flame inside the open flare and send signal to the monitoring station) Brand/Manufacturer : USHIO Inc. Model : SF-102B
Level	N/A
Calibration frequency requirement	N/A, however the periodic checking of the detector has been conducted manually.
Calibration date	N/A
Validity	N/A
Are there delays in calibration?	N/A
Calibration Entity	N/A
Accreditation Certificate for the calibration entity	N/A

Monitoring equipment	Analogue Gauge
Monitoring parameter	Operation of the energy plant (hours)
S/N	N/A
Type	Analogue gauge attached to the generator set
Level	N/A
Calibration frequency requirement	N/A, however the periodic checking of the gauge has been conducted manually.
Calibration date	N/A
Validity	N/A
Are there delays in calibration?	N/A
Calibration Entity	N/A
Accreditation Certificate for the calibration entity	N/A

3.7 Summary of compliance with the calibration frequency requirements for measuring instruments.

The calibrations of the following measuring equipment have impact on the claimed emission reductions:

- A. Flow meter measuring the total amount of landfill gas captured
- B. Flow meter measuring the amount of landfill gas flared
- C. Flow meter measuring the amount of landfill gas combusted in power plant
- D. Gas analyser measuring the methane fraction in the landfill gas
- E. Electricity meter measuring the total amount of electricity exported out of the project boundary
- F. Electricity meter measuring the total amount of electricity imported to meet project requirement

As detailed out in section 3.6 of this report, calibration of the measuring instruments^{/33/} have been done in line with the requirement defined in the approved monitoring methodology and no delay calibration was observed for any of the measuring instruments calibration for the monitoring period under consideration.

There was a gap observed from the submitted calibration certificates for the monitoring devices of the project activity during site visit, thus **CL#03 was raised** to obtain the calibration certificates covering the claimed monitoring period (i.e. 14/03/2008 – 31/12/2008). In response, the PP provided the calibration certificates of the monitoring devices covering the monitoring period. Unless, the power meter which its practice for monitoring equipment is not within the control of Project Participants but MEA (Metropolitan Electricity Authority). Nevertheless, the MEA has issued the confirmation letter^{/28/} issued on 31/07/2009 that quantity of electricity imported from and exported to the grid are accurate since March 2006. As well as the internal documents of MEA for the meter testing and calibration have been provided^{/33/}. The calibration certificates and confirmation letter have been verified and found satisfactorily, **CL#03 was closed**. The details of the monitoring instruments and calibration detail are shown in section 3.6 of this report.

CAR#11 was raised because the Monitoring Report version 1 did not provide any information for the calibration records (calibration certificate number, date of calibration, and validity the certificates. In response, the Monitoring Report version 1 has been revised with required information. Despite the LFG is required to be monitored continuously in the registered monitoring plan, the PP reported this parameter only hourly readings which cannot be categorized as continuous. The PP clarified that LFG is continuously monitored with recording frequency at five-second interval from the beginning of the monitoring period (i.e. 14/03/2008). The recording frequency was then adjusted to one-minute interval since 05/08/2008 while the gas was continued to be continuously monitored. The monitored data were aggregated to hourly values for the sake of emission reduction calculation as provided in the attached spreadsheet. The justification towards the calibration frequency is required because the registered PDD indicated that the device will be calibrated as per manufacturing specification. The calibration frequencies of measuring equipments from manufacturers were listed in the supporting document. The assessment team has checked and found that there is no gap or delayed in calibrations. This is found reasonable and accepted, **CAR#11 was closed out**.

It is confirmed that the error is applied;

- i. In a conservative manner such that the adjusted measured values of the delayed calibration shall result in fewer claimed emission reductions.
- ii. For all measured values taken during the period between the scheduled date of calibration and the actual date of calibration.

3.8 Accuracy of Emission Reduction Calculations

The calculation of emission reductions is found to be correct. The response to findings was satisfactory and these were closed. The details of the reported and the verified values for all parameters are listed in section 4, 'Calculation of Emission Reductions'.

CAR#07 and CAR#08 were raised asking the PP to justify the data mismatch of the gross electricity generation and electricity exported to the grid. Details are elaborated in section 9 of this report. In response, the PP revised the Monitoring Report^{/3/} and spreadsheet^{/5/} to be consistent with the plant records^{/38/} and supporting documents^{/27/}. **CAR#07 and CAR#08** were closed due to correction in the attached spreadsheet which is consistency with the monitoring report.

Because there was no explanation given why the flow of LFG did not report for several days (eg. from 11/09/2008 to 20/09/2008), the PP was requested to elaborate the appropriate reason. Furthermore, the PP was also requested to explain why LFG flow was reported as negative values in the SCADA system and justify the estimation of PE_{flare} . Due to these reasons, **CL#13 was raised**. The PP clarified that the "Top end overhaul" was carried out during 11/09/2008 to 20/09/2008^{/38/}. So, LFG flow was not reported for several days in such a period. Moreover, due to the fault in transmission and distribution system of MEA, the engine was unexpectedly stopped, which led to the variance of the amount of LFG flow and other monitored parameters. In addition, while the power plant was shut down, the flow meter detected flow of gas where in fact there was no LFG flow through flow meter. This caused the negative value of monitored data. The negative value was removed during the data processing. The explanations are also provided in the revised calculation spreadsheet. The method to calculate PF_{flare} has been following tool to determine project emissions from flaring gases containing methane. The revised Monitoring Report and calculation spreadsheet were checked and found consistent. The erroneous data in the calculation spreadsheet was deleted, resulting in lower emission reductions. From the above reasons, **CL#13 was closed out satisfactory**.

In addition, **CAR#14 was raised** because the reported quantity of LFG total was found less than summed up quantity of LFG flared and LFG burnt to generate electricity in some days (i.e. 01/06/2008, 04/07/2008 and 13/07/2008) which is theoretically impossible. In response, the PP decided to calculate the emission reductions based on the LFG utilized for the electricity generation only ($LFG_{electricity}$) which is conservative. In such a period where no gas was collected and utilized, emission reduction would be reported as zero for the particular hours. This caused emission reduction decreased about 44 tCO₂e compare to previous calculation in the monitoring report version 1^{/4/}. The PP's justification is reasonable and conservative; **CAR#14 was closed out**.

CL#15 was raised to obtain the PP's clarification on the method used for monitoring the flare operation parameters as per the registered monitoring plan. The PP clarified that the default value of 50% was chosen as the flare efficiency as per the "Methodological Tool to determine project emissions from flaring gases containing methane" and the registered monitoring plan. The flame detector was installed to continuously monitor the flare operation parameter and selected the flare efficiency (i.e. 50% or 0%). The revised Monitoring Report and calculation spreadsheet also was provided. This has been verified and found that all parameters related to the flare operation has been justified in the revised Monitoring Report version 4 and revised spreadsheet. All information is in accordance with the monitoring plan of registered PDD, so **CL#15 was closed out**.

The emission reduction in the excel spreadsheet was checked for the baseline, project and leakage emission calculation and found to be correct. The assumption and the data used for the calculation have been properly justified and the details of the evidence checked and discussed under section 3.5.1 and 3.11 of this report.

3.9 Quality of Evidence to Determine Emission Reductions

Critical parameters used for the determination of the Emission Reductions are discussed in section 3.4 above. All the data recorded is in compliance with the monitoring report.

3.10 Management and operational System and Quality Assurance

The companies involved in the project have ISO 9001:2000^{/17/} quality assurance system implemented; therefore we can affirm that the management system of the CDM project is in place, with the responsibilities properly identified and in place.

In order to verify data quality, the Companies involved in the project work in accordance with a quality assurance procedure i.e. an operating procedure manual for the project activity implementation which includes details of data to be monitored, quality assurance procedures, periodic meter testing and calibration schedules etc. A GHG performance procedural manual is also in place for all the persons involved and associated with monitoring of project activity. The manual described the responsibility for monitoring of parameters. This establishes the operational and management structure implemented.

CL#02 was raised to clarify the management and operational system adopted in project implementation and monitoring. In response, the PP provided Job descriptions^{/14/}, training records^{/13/}, data archiving procedure and document retention time^{/21/} and minute of management system^{/17/} that can affirm the management system of the project activity is in place; with the responsibilities properly identified, in place and consistent with CDM requirements. Thus **CL#02 is closed**.

3.11 Data from External Sources

The parameters from the registered PDD which are used to calculate emission reduction of this project activity are as followings.

- Global warming potential for CH₄ (GWP_{CH4}) as 21 (tCO_{2e}/tCH₄), this is obtained from the IPCC value.
- Adjustment factor (AF) as 0%. Since there is no reference source of related regulatory requirement for LFG in neither the registered PDD nor validation report, **CL#05 was raised** for asking documented evidence for suitability of selected AF as per applied methodology. In response, the PP provided the supporting documents of landfill regulation^{/26/} and in-house regulation monitoring procedure^{/19/,/20/} which found that there is not any regulation enforced for LFG utilization. Thus, the AF value is still valid and applicable as zero. Due to the reason above, **CL#05 was closed**.
- CO₂ emission factor of the grid (EF_{grid}) as 0.51 tCO₂/MWh, this parameter is calculated based on the combined margin (CM) as per data choice and calculation method of AMS I.D version 11. The calculation based on the data for the year 2001, 2002 and 2003 which are the most recent data available at the time of the validation. The data used for calculation are obtained from EGAT, EPPO as shown in the registered PDD.

There is an additional parameter which also obtained from other source and not present in the parameter listed in section B.6.2 of the registered PDD as below.

- Density of Methane at normal condition (D_{CH4}) as 0.7168 kg/m³, this value is adopted from "Tool to determine project emission from flaring gases containing methane".

The assessment team has checked the additional data as mentioned above by reviewing the registered PDD, interviewing and checking with the references provided. The assessment team confirm that these additional data sources are appropriate and acceptable in order to determine emission reduction of the project activity.

4. Calculation of Emission Reductions

Parameter	Reported Value ^{4/}	Verified Value ^{3/}
Total amount of landfill gas captured (LFG _{total,y})	3,489,990 m ³	3,460,731 m ³ ¹
Amount of landfill gas flared (LFG _{flare,y})	101,056 m ³	98,106 m ³
Amount of landfill gas combusted in power plant (LFG _{electricity,y})	3,388,934 m ³	3,224,369 m ³
Methane fraction in the landfill gas (W _{CH4,y}) or Volumetric fraction of CH4 in the residual gas in the hour (fv _{CH4,h})	50.1 % (Average value)	50.2 % (Average value)
Total amount of electricity exported out of the project boundary (EL _{EX,LFG})	5,564 MWh	5,289 MWh
Total amount of electricity imported to meet project requirement (EL _{IMP})	8 MWh	8 MWh
Density of Methane at normal condition (D _{CH4})	0.0007168 tCH ₄ /Nm ³ CH ₄	0.0007168 tCH ₄ /Nm ³ CH ₄
CO2 emission intensity of electricity displaced (CEF _{electricity})	0.51 tCO ₂ /MWh	0.51 tCO ₂ /MWh
Adjustment Factor (AF)	0 %	0 %
Flare efficiency	0 % PP hasn't claimed any ER for LFG flare	0 % PP hasn't claimed any ER for LFG flare

As per ACM0001 version 05

$$ER = (MD_{project,y} - MD_{reg,y}) * GWP_{CH4} + EL_y * CEF_{electricity} - ET_y * CEF_{thermal}$$

Where: 1. Project activity not implementing the thermal energy generation unit ; MD_{thermal,y} and ET_y = 0

2. No enforced regulatory or contractual requirement for LFG collection/utilization ; AF = 0 %

$$\begin{aligned} \text{Hence; } MD_{reg,y} &= MD_{project,y} * AF \\ &= 0 \end{aligned}$$

3. All record of flare operating in an hour not exceed 20 minutes; Flare efficiency = 0 %

$$\begin{aligned} \text{Hence ; } MD_{flare,y} &= (LFG_{flare,y} * w_{CH4} * D_{CH4}) - (PE_{flare,y} / GWP_{CH4}) \\ &= 0 \text{ Nm}^3 \text{ (because there is no methane destruction at flaring system)} \end{aligned}$$

¹ This value is measured by the independent flow meter hence it is not equal to the summation of quantity of LFG combusted in power plant and quantity of LFG sent to flare (i.e. 3,322,475 m³). The conservative values have been used to calculate emission reduction in this monitoring period. Justification of conservativeness has been checked and described under section 3.8 above (CAR#14)

There

$$\begin{aligned} ER &= (MD_{\text{project}} - MD_{\text{reg}}) * GWP_{\text{CH}_4} + EL * CEF_{\text{electricity}} - ET * CEF_{\text{thermal}} \\ &= [1,160.36 \text{ (tCH}_4\text{)} * 21 \text{ (tCO}_2\text{/tCH}_4\text{)}] + [5,281 \text{ (MWh)} * 0.51 \text{ (tCO}_2\text{/MWh)}] \\ ER &= \mathbf{27,060 \text{ tCO}_2\text{e}} \end{aligned}$$

$$MD_{\text{project},y} = MD_{\text{flared},y} + MD_{\text{electricity}} + MD_{\text{thermal},y}$$

As

$$\begin{aligned} MD_{\text{project},y} &= MD_{\text{electricity}} = LFG_{\text{electricity}} * w_{\text{CH}_4} * D_{\text{CH}_4} \\ &= 3,224,369 \text{ (m}^3\text{)} * 50.2 \% * 0.0007168 \text{ (tCH}_4\text{/Nm}^3\text{)} \\ &= \mathbf{1,160.36 \text{ (tCH}_4\text{)}} \end{aligned}$$

$$EL_y = EL_{\text{EX,LFG}} - EL_{\text{IMP}}$$

As

$$\begin{aligned} &= 5,289 - 8 \\ &= \mathbf{5,281 \text{ (MWh)}} \end{aligned}$$

5. Recommendations for Changes in the Monitoring Plan

No recommendations were made as the monitoring plan was appropriate.

6. Overview of Results

Assessment Against the Provisions of Decision 17/CP.7:

Is the project documentation in accordance with the requirements of the registered PDD and relevant provision of decision 17/CP.7, EB decisions and guidance and the COP/MOP?

Yes. The results of the compliance assessment are recorded in the verification checklist which is used as an internal report only.

Have on-site inspections been performed that may comprise, inter alia, a review of performance records, interviews with project participants and local stakeholders, collection of measurements, observations of established practices and testing of the accuracy of monitoring equipment?

Yes. All required members of the assessment team (Pitipoom Tungsirisuteekul : Lead Assessor, Nattarin Thunsiri : Assessor, Kasamol Sansanakul : Local Assessor and Ashok Kumar Gautam : Sectoral Scope Expert) visited the sites and undertook interviews, collected data, audited the implementation of procedures, checked calibration certificates and checked data, inter alia.

The results of the site visits are recorded in the verification checklist which is used as an internal report only.

The evidences have been checked and collected. The final monitoring report is attached with this verification report.

Has data from additional sources been used? If yes, please detail the source and significance.

Yes, additional data has been used from external source and significance explained in section 3.11 above.

Please review the monitoring results and verify that the monitoring methodologies for the estimation of reductions in anthropogenic emissions by sources have been applied correctly and their documentation is complete and transparent.

Yes. The monitoring methodology has been correctly applied and the Monitoring Report and supporting references are complete and transparent.

Have any recommendations for changes to the monitoring methodology for any future crediting period been issued to the project participant?

No.

Determine the reductions in anthropogenic emissions by sources of greenhouse gases that would not have occurred in the absence of the CDM project activity, based on the data and information using calculation procedures consistent with those contained in the registered project design document and the monitoring plan.

The data used in anthropogenic emission reduction calculation is consistent with those contained in the revised PDD and monitoring plan. The emission reduction was 61,312 tCO₂ for the period 14/03/2008 to 31/12/2008 as per the estimation made in the revised PDD. The actual emission reduction has been verified as 27,060 tCO₂ for the same period.

Identify and inform the project participants of any concerns related to the conformity of the actual project activity and its operation with the registered project design document. Project participants shall address the concerns and supply relevant additional information.

Yes, the non conformity of the actual project activity and its operation with the registered project design document has been observed. The capacity of electricity generation set is different with the information contain in the registered PDD. Details of post registration change are explained in section 3.2 above. As this is the first

monitoring period to project activity hence no impact of non conformance on the verifications conducted earlier or CERs issued during previous verifications.

Post monitoring report on UNFCCC website

Yes, the Monitoring Report is available at ref. 1413 on UNFCCC website

<http://cdm.unfccc.int/Projects/DB/DNV-CUK1194442031.0/iProcess/SGS-UKL1245144358.76/view>

7. Verification and Certification Statement

SGS United Kingdom Ltd. has been contracted by Jaroensompong Co.,Ltd. to perform the verification of the emission reductions reported for the CDM project "Jaroensompong Corporation Rachathewa Landfill Gas to Energy Project" (UN reference project No.1413) in the period 14/03/2008 – 31/12/2008.

The verification is based on the validated and registered project design document and the monitoring report for this project. Verification is performed in accordance with section I of Decision 3/CMP.1, and relevant decisions of the CDM EB and CoP/MoP. The scope of this engagement covers the verification and certification of greenhouse gas emission reductions generated by the above project during the above mentioned period, as reported in the Monitoring Report version 8.3 dated 29/09/2012.

The management of Jaroensompong Co.,Ltd. is responsible for the preparation, calculation and determination of GHG emission reductions from the project. The development and maintenance of records and reporting procedures are in accordance with the monitoring report.

It is our responsibility to express an independent GHG verification opinion on the GHG emissions and on the calculation of GHG emission reductions from the project for the period 14/03/2008 – 31/12/2008 based on the reported emission reductions in the Monitoring Report version 8.3 dated 29/09/2012 for the same period.

Based on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate these, SGS planned and performed our work to obtain the information and explanations that we considered necessary to provide sufficient evidence for us to give reasonable assurance that this reported amount of GHG emission reductions for the period is fairly stated.

SGS confirms that the project is implemented as described in the validated and registered project design documents. Based on the information we have seen and evaluated, we confirm the following:

Project Title:	Jaroensompong Corporation Rachathewa Landfill Gas to Energy Project
UNFCCC Reference Number:	1413
Registered PDD and Approved Used for Verification:	Registered PDD version 03, dated 27/06/2007 And Revised PDD for post registration changes version 3.6, dated 29/09/2012
Methodology Used for Verification:	ACM0001 Version 5 (Valid from 21 Dec 06 to 05 Jul 07)
Applicable Period:	14/03/2008 – 31/12/2008
Total GHG Emission Reductions Verified:	27,060 CERs

Signed on behalf of the Verification Body by Authorized Signatory

Signature:



Name: Siddharth Yadav

Date: 16/01/2013

8. Document References

- /1/ Revised PDD version 03.6 dated 29/09/2012
- /2/ Revised ER calculation for revised PDD version 03.6
- /3/ Monitoring report version 8.3 dated 29/09/2012 (VVS Track, Final MR)
- /4/ Monitoring report version 1 dated April 2009 (VVM Track, Webhosted MR available at <http://cdm.unfccc.int/Projects/DB/DNV-CUK1194442031.0/iProcess/SGS-UKL1245144358.76/view>)
- /5/ Emission reduction spreadsheet for MR version 8.3
- /6/ Clean Development Mechanism Validation and Verification Standard version 02.0 dated 25/11/2011
- /7/ Monitoring Report Form (F-CDM-MR) version 02.0 dated 13/03/2012 and Guidelines for completing the monitoring report form version 02.0 (EB66 Annex20)
- /8/ Clean Development Mechanism Project Standard version 02.1 dated 03/12/2012
- /9/ Registered PDD, version 03, dated 27/06/2007 (available on webpage at <http://cdm.unfccc.int/Projects/DB/DNV-CUK1194442031.0/view>)
- /10/ Validation Report by DNV, report No. 2007-1017, dated 14/09/2007 (available on webpage at <http://cdm.unfccc.int/Projects/DB/DNV-CUK1194442031.0/view>)
- /11/ Approved methodology ACM0001 version 5 and AMS I.D version 11
- /12/ Gross Electricity Generation Cross-referenced Spread Sheet (Energy balance with fuel consumption)
- /13/ Procedure for Training & training record:
 - Maintenance
 - Gas Engine Operation
 - Gas Analyser
 - Gas Collection System
- /14/ Job Description to allocation of responsibilities, authorization, and job description
 - Operation Manager
 - Operator
 - Financial Manager
 - Accounting
 - Purchasing
 - Managing Director
 - Human Resources
 - Documental Control officer
 - Maintenance Operator
 - Quality Management Representative
- /15/ List of equipment & Commissioning Report for Rachathewa Power Plant Project Jaroensompong Co.,Ltd.
- /16/ Commissioning Report for WISCO DATA LOGGER SYSTEM, Dated 27/12/2007 to replaced monitoring method
- /17/ Minute of meeting by Quality Management Representative, Dated 20/08/2007 and ISO 9001 certificate
- /18/ Project Organization Chart
- /19/ Landfill Gas Regulatory Monitoring procedure for guidance to monitor regulatory requirement related to landfill gas project
- /20/ Landfill Regulatory Requirement List
- /21/ Archiving Procedure for procedure of data archiving and retention time of the monitored data
- /22/ JS Monitoring Procedure for normal and emergency plan for CDM project implementation and QA/QC

- /23/ Confirmation of Commissioning and Test Run Period from Metro Machinery Co., Ltd., letter was issued on 25/09/2009
- /24/ Flow correction for differential Pressure Method that used for calculation and the example calculation sheet
- /25/ Contract between Jaroensompong Co., Ltd. and Pairojsompong Panitch Ltd. for construction, Dated 13/07/2004, effective dated on 01/08/2004 to prove for the starting date of this project activity
- /26/ TGO Carbon Monthly to prove that there are no regulatory or contractual requirements for landfill gas collection or combustion, June 2009
- /27/ Electricity invoices and electricity statement issued by MEA
- /28/ MEA letter confirmation to assure that quantity of electricity imported from and exported to the grid are accurate since March 2008, issued dated July 31,2009
- /29/ Specification of gas generator set, Manufacturer Caterpillar, Model CAT G3516, 1100 ekW, 1375 kVA, 50 Hz, 1500 RPM, 400 Volts
- /30/ Nameplate of gas generator , Manufacturer Caterpillar, year 2004, 1100 kW, Model G3516, gen S/N 5WN02543
- /31/ Power purchase agreement between JS & MEA, dated 14/07/2005, limitation of electricity export to grid at 1 MW.
- /32/ Quotation of gas generator set from Metro machinery Co.,Ltd. , Model G3516 dated 09/10/2005
- /33/ Verification/Calibration plan and Calibration Certificate:
 - Gas Flow Meter 1, Serial No. N1T1109491336
 - Gas Flow Meter 2, Serial No. N1U0139599904
 - Gas Flow Meter 3, Serial No. N1U0139599905
 - Fixed Type Gas Analyzer, Serial No. I-02253
 - Flame Detector, Serial No. 945011V
 - Temperature Controller 1, Serial No. T07216/PT07081
 - Temperature Controller 2, Serial No. T08003/PT08015
 - Temperature Controller 3, Serial No. T08151/PT08133
 - Pressure Transmitter 1, Serial No. 1107030328
 - Pressure Transmitter 2, Serial No. 1107030324
 - Pressure Transmitter 3, Serial No. 0702080001
- /34/ Operation and Maintenance Manual for G3500 series engine, Manufacturer Caterpillar, May 1999
- /35/ Confirmation from PP on the auxiliary devices on site and its rated watts, dated 17/01/2012
- /36/ Confirmation from technology supplier on the auxiliary electricity consumption for the generator, information provided by Khun Singtong from MetroCAT, dated 05/01/2012
- /37/ Summary report from the SCADA system
- /38/ Plant log book and the plant operating/maintenance record
- /39/ Confirmation from the technology supplier on the Standard Temperature and Pressure condition report by the LFG flow meter installed in the project activity. Dated 29/09/2009 by Alpha S&E Co.,Ltd.

Main changes and reason for Revision to the final version of the MR^{3/} from webhosted MR^{4/} (non-exhaustive)

The webhosted MR is developed by the project participant as there is no any standard MR format available at that time (under VVM track). However in the later stage, project participant has revised the MR to comply with standard MR format from UNFCCC (VVS track).

- Section A.2 : Description of the project activity was elaborated
- Section A.3 : Company's name of project participant is changed which revised to consistent with latest information
- Section B.1: Description of implementation followed the registered PDD and schedule were added
- Section B.2: Details of post registration changes were added.
- Section C: Details of monitoring system was elaborated.
- Section D: Details of parameters are revised to consistent with the standard form.
 - a) Added the monitoring devices used for each parameters
 - b) Added the calibration details of all devices used in this monitoring period
- Section E : The details of calculation of emission reduction were added
 - a) Correction is made in the verified values
 - b) Information of emission reduction comparison between the ex-ante ER from revised and verified ER
 - c) Clarification of the different from the PDD and verified values was added
 - d) Summary table of the value used in the revised PDD and verified values were added

9. Findings Overview

Findings Overview Summary

	CARs	CLs	FARs
Total Number raised	11	7	0

Date:	01/07/2009	Raised by:	Assessment Team		
Type:	CL	Number:	01	Reference:	A.2
Lead Assessor Comment:		Date: 01/07/2009			
<u>Commissioning Certificate</u> Please provide the commissioning certificate of the physical equipments to ensure that all required facilities and equipment as described by the PDD has been finished at time of initial verification.					
Project Participant Response:		Date: 31/07/2009			
Please find the list of equipments & Commissioning Report as per attachments					
Documentation Provided as Evidence by Project Participant:					
1. List of equipment & Commissioning Report					
2. Commissioning Report for WISCO DATA LOGGER SYSTEM (Replaced Monitoring Method)					
Information Verified by Lead Assessor:					
1. The commissioning certificate of the equipments shown that all equipments have been finished on time of initial verification, so this issue is closed.					
2. The following of the monitoring equipments in monitoring report are not matching with the list of equipments & commissioning. Please justify.					
Monitoring Equipment		Monitoring Report		List of Equipments & Commissioning	
Gas Flow Meter (FL-02)		S/N: N1U0139599904		S/N: N1U0139599904	
Gas Flow Meter (FL-03)		S/N: N1U0139599905 Model: Verabar V100/ 7MF4433-1B22-146-Z		S/N: N1U0139599905 Model: Verabar V100/ 7MF4433-1BA22-146-Z	
Fixed Type Gas Detector (GA-02)		Device Name: Fixed Type Gas Detector		Device Name: Fixed Type Gas Analyzer	
3. Some equipments that are mentioned on the monitoring report (section of list, specification and appropriateness of all monitoring equipment) did not have the commissioning certificate (electricity meter and portable gas analyzer), Please provide the documental evidence.					
4. Please provide the supportive information to confirm that the replaced monitoring method of data logging system is not affected to the project activity.					
Reasoning for not Acceptance or Acceptance and Close Out:		Date: 09/08/2009			
CL 01 is opened due to:					
1. Data mismatch between the monitoring report and the list of equipments & commissioning need more clearly justify. And also provide the documental evidence for power meter and proof of portable gas analyzer was available during verification period which mentioned on the monitoring report.					
2. Please justify that the replaced monitoring method of data logging system is not affected to the project activity.					
Project Participant Response:		Date: 15/10/2009			

Please kindly find the clarification of task No.2 to No.4 as following	
<p>2. - There was a typo of S/N of Gas Flow Meter (FL-02) and (FL-03) in the list of equipments & commissioning by supplier. The S/N of (FL-02) and (FL-03) in monitoring report is referred from their calibration certificates.</p> <p>- The device name of GA-02 in monitoring report has been reconciled with list of equipments & Commissioning. Please kindly find the monitoring report as per attached</p> <p>3. Please kindly find the electricity meter factory test including the test timesheet and portable gas analyzer 's calibration certificate (commissioning certificate) as per attachments.</p> <p>Note that the portable gas analyzer has two functions; the one for landfill site activity and the other as a back-up equipment in case that the fixed type gas analyzer is out of service.</p> <p>4. The replacement of monitoring method of data logging system has no impact on the project activity and monitoring equipment. WISCO DATA Logger, an automatic data recording system, has been installed since December 2007 in order to facilitate the more efficient monitoring activity. WISCO is able to continuously read, record and electronically keep more data for each monitoring parameter compared to the previous monitoring system. Prior to WISCO installation, the monitored data was manually recorded by an operator through Siemens WINCC Flexible runtime Programming HMI's (Siemens WINCC) display.</p>	
Documentation Provided by Project Participant:	
<ul style="list-style-type: none"> • JS Monitoring Report Rev.03_2009 10 15 [Page 14 Section 2.3.4 IV] • Commissioning Certificate of ; <ul style="list-style-type: none"> - Electricity meter [File name: JS MEA meter test.pdf / sheet name : First meter factory test page 2/5 and New meter factory test page 2/5] - Portable gas analyzer [File name: 1002.pdf] 	
Information Verified by Lead Assessor:	
<ol style="list-style-type: none"> 1. Clarification from PP, the typo of S/N in the list of equipment is found reasonable which verified against picture taken during site visit and consistent to the revised MR provided. 2. Device name has been corrected to represent the equipment function (Gas Analyzer). 3. Substantiation on the electricity meter calibration and periodic test are found satisfactory, also the confirmation letter from MEA for the quantity of electricity exported to MEA. 4. The portable methane gas analyser is found satisfactory in the first calibration certificate. Clarification that the figure reported in emission reduction calculation sheet is not relate to figure analyse from portable analyser are found acceptable. 5. WISCO Data recording has been changed since December 2007 that before project registration date which this type of data logging system is covered the whole monitoring period hence there is no any effect to data reporting. 	
Reasoning for Acceptance and Close Out:	Date: 11/11/2009
CL#1 is closed as found satisfactory in the revised MR and PP justification	
Acceptance and Close out by Lead Assessor:	Date: 11/11/2009

Date:	01/07/2009	Raised by:	Assessment Team		
Type:	CL	Number:	02	Reference:	B.2, B.4, B.5 and B.6
Lead Assessor Comment:			Date: 01/07/2009		
<u>Management and Operational System</u>					
<p>a) Please elaborate how the allocation of responsibilities for the project implementation and monitoring is defined and documented. Also, provide the organization chart, job description and training record of the person in charge.</p> <p>b) Kindly substantiate the procedure of procedure of data archiving and retention time of all monitoring data.</p> <p>c) Internal Audit report and Minute of management review of the monitoring data is to be obtained.</p> <p>d) Please provide the QA/QC and emergency procedures in case of unexpected problems with monitoring equipments, data access and/or data quality.</p>					
Project Participant Response:			Date: 31/07/2009		
<p>a) The project implementation is managed by an operation manager and operated by an operator in accordance with the organization chart and job description for operators whereas the monitoring activities are controlled by an operator specifically assigned for the monitoring of the CDM project activity. Please find organization chart, job description and training record as attached. Please also note that the training record of the person in charge is represented in "skill matrix" and "On the job training records"</p> <p>b) Procedures of data archiving and retention time of the monitored data are substantiated in the attached "JS_Archiving Procedure".</p> <p>c) Internal Audit Report and management review of the monitored data are attached.</p> <p>d) QA/QC and emergency procedures in case of unexpected problems with monitoring equipments, data access and/or data quality is presented in the attached "JS_CDM Monitoring Procedure".</p>					
Documentation Provided as Evidence by Project Participant:					

<p>a) Documents on the allocation of responsibilities, organization chart, job description and training record of operation in charge</p> <ul style="list-style-type: none"> • Organization Chart • JD-OPD MANAGER • JD-OPD-OPERATOR • Skill Matrix • OJT gas analyser • OJT Gas Collection System <p>b) Procedure of data archiving and retention time of the monitored data</p> <ul style="list-style-type: none"> • JS_Archiving Procedure <p>c) Internal Audit Report and management review</p> <ul style="list-style-type: none"> • Internal Audit Car_Par Log book2 • Management Review <p>[File name : 500820 minute of mng review, File name : 510922 minute of mng review, File name : 511225 minute of mng review]</p> <p>d) QA/QC and emergency procedures</p> <ul style="list-style-type: none"> • JS_CDM Monitoring Procedure 	
<p>Information Verified by Lead Assessor:</p> <p>a) The training record (OJT gas analyzer.pdf and OJT Gas Collection System.pdf) of the person in charge was already attached in this comment. However, please explain the information more elaborately as follow:</p> <ul style="list-style-type: none"> - Elaborately specify how the allocation of responsibilities for the project implementation and monitoring are defined and documented. - Attached information of JD-OPD-OPERATOR is not completed, please identify. - Provide all of job description that referred in organization chart. - For the Skill Matrix attached file, please provide the information if the skill is lower than minimum skill. <p>b) The attached file of JS archiving procedure is already informed the retention time and the procedure of data archiving of the monitoring data, However the retention time is not consistent with the methodology</p> <p>c) The documentary evidence of Internal Audit Report and Minute of management review attached file has been provided for the monitoring data, so this issue is closed.</p> <p>d) The CDM Monitoring Procedure (JS_CDM Monitoring Procedure.pdf) that aimed to establish the proper guidance during normal and emergency situation of CDM data/parameter monitoring has been provided in this project, so this issue is closed.</p>	
<p>Reasoning for not Acceptance or Acceptance and Close Out:</p>	<p>Date: 09/08/2009</p>
<p>CL 02 is opened due to need more completely information of JD-OPD-OPERATOR.4 and the job description that referred in organization chart. Also provide the specific information on how the allocation of responsibilities for the project implementation and monitoring. Finally, how to do if the skill matrix of the person is lower than minimum standard.</p> <p>Furthermore, the retention time of documentation listed in the procedure is not in line with methodology. Please justify</p>	
<p>Project Participant Response:</p>	<p>Date: 15/10/2009</p>

<p>Please kindly find the clarification of task a) and task b) as following</p> <p>a) - Please find attached the allocation of responsibilities in the job description that referred in the organization chart.</p> <p>- JD-OPD-OPERATOR: The operator works under the command of Operation Manager (OPD). His authorization is specified in the responsibility task, resulting in authorization task being left blank. To avoid misunderstanding the authorization task was removed.</p> <p>- The plant personnel who have lower skill than minimum skill requirement will be re- trained until they gain the minimum skill otherwise they will be rotated to other appropriate position and/or they will be halted to do the work subject to their failure skill. Please kindly find information in training procedure as attached.</p> <p>b) There was a misunderstanding in retention time of documentation. The retention time has been reconciled with methodology specify in PDD. Please kindly find JS_Archiving Procedure Rev.01.vsd as attached.</p>	
Documentation Provided by Project Participant:	
<ul style="list-style-type: none"> Job Description referred in organization chart [File Name: JD-FAD-001.pdf, JD-FAD-002.pdf, JD-FAD-004.pdf JD-HRD-001.pdf, JD-HRD-002.pdf, JD-HRD-003.pdf, JD-HRD-004.pdf, JD-HRD- 005.pdf, JD-OPD-001.pdf, JD-OPD-002.pdf, JD-OPD-003.pdf, JD-OPD-004.pdf] Training Procedure [File Name: PM-HRD-002.pdf page 4/6] JS_Archiving Procedure Rev.01.vsd 	
Information Verified by Lead Assessor:	
<p>Job description of the position indicated under the organization chart have been provided that found satisfactory</p> <p>Clarification on the process for the staff which has not pass the assessment matrix found reasonable and realistic</p> <p>Archiving procedure of the project has been revised to consistent with the requirement of Monitoring methodology.</p>	
Reasoning for Acceptance and Close Out:	Date: 11/11/2009
CL02 is closed as found satisfactory in supporting documents provided with clear explanations.	
Acceptance and Close out by Lead Assessor:	Date: 11/11/2009

Date:	01/07/2009	Raised by:	Assessment Team		
Type:	CL	Number:	03	Reference:	SV and MR
Lead Assessor Comment:			Date: 01/07/2009		
<u>Calibration Certificates</u>					
Please provide calibration certificate of the following monitoring equipments.					
Monitoring Equipment			Monitoring Period		
Power meter to quantify the gross electricity generation			14/03/2008 – 31/12/2008		
Power meter to quantify the electricity exported to grid			14/03/2008 – 31/12/2008		
Power meter to quantify the electricity imported			14/03/2008 – 31/12/2008		
Biogas flow meter to quantify total amount of landfill gas captured (FL02)			14/08/2008 – 31/12/2008		
Biogas flow meter to quantify amount of landfill gas flared (FL01)			25/09/2008 – 31/12/2008		
Biogas flow meter to quantify amount of landfill gas combusted in power plant (FL03)			25/09/2008 – 31/12/2008		
Gas detector (GA02)			25/12/2008 – 31/12/2008		
Temperature controller (TE03)			14/03/2008 – 21/07/2008		
Temperature controller (TE01)			14/03/2008 – 31/12/2008		
Pressure transmitter (PR03)			14/03/2008 – 13/08/2008		
Pressure transmitter (PR01)			14/03/2008 – 31/12/2008		
Methane content analyzer (GA01)			14/03/2008 – 12/05/2008		
Project Participant Response:			Date: 31/07/2009		

Please kindly find the calibration certificate of the following monitoring equipments and the period that monitoring equipments were operated and calibrated as attached.

Monitoring Equipment	Monitoring Period	File name
Power meter to quantify the gross electricity generation	14/03/2008 – 31/12/2008	E08-001C, E08-0380B
Power meter to quantify the electricity exported to grid	14/03/2008 – 31/12/2008	MEA Calibration, MEA Meter Test
Power meter to quantify the electricity imported	14/03/2008 – 31/12/2008	MEA Calibration, MEA Meter Test
Biogas flow meter to quantify total amount of landfill gas captured (FL02)	14/08/2008 – 31/12/2008	RKT-0709036, P08/0238C
Biogas flow meter to quantify amount of landfill gas flared (FL01)	25/09/2008 – 31/12/2008	RKT-0809045
Biogas flow meter to quantify amount of landfill gas combusted in power plant (FL03)	25/09/2008 – 31/12/2008	RKT-0809044
Gas detector (GA02)	25/12/2008 – 31/12/2008	E080003
Temperature controller (TE03)	14/03/2008 – 21/07/2008	T-0807154 (TE-03 was not in used in the period of 14/03/2008- 21/07/2008)
Temperature controller (TE01)	14/03/2008 – 31/12/2008	T-0710080 (TE-01 was not in used in the period of 22/07/2008- 31/12/2008)
Pressure transmitter (PR03)	14/03/2008 – 13/08/2008	P08-0239C (PR-03 was not in used in the period of 14/03/2008 – 1/08/2008)
Pressure transmitter (PR01)	14/03/2008 – 31/12/2008	CAL0069-07Q0077 (PR-01 was not in used in the period of 02/08/2008 – 31/12/2008)
Methane content analyzer (GA01)	14/03/2008 – 12/05/2008	GM07309_1/1317, GM07309_1/2367

Documentation Provided as Evidence by Project Participant:

1. Calibration details.

2. Calibration Certificate

[File Name : MEA Calibration, MEA Meter Test, E08-001C, E08-0380B, RKT-0709036, P08/0238C, RKT-0809045, RKT-0809044, E080003, T-0807154, T-0710080, P08-0239C, CAL0069-07Q0077, GM07309_1/1317, GM07309_1/2367]

Information Verified by Lead Assessor:

<p>1. Calibration certificate of power meter to quantify the gross electricity generation (E08-0001C.pdf) was operated and calibrated in the monitoring period of 14/03/2008 – 31/12/2008, so this issue is closed.</p> <p>2. Calibration certificate of Power meter to quantify the electricity exported to grid (MEA MeterTest.pdf) was operated and calibrated in the monitoring period of 14/03/2008 – 31/12/2008, so this issue is closed.</p> <p>3. Calibration certificate of Power meter to quantify the electricity imported (MEA Calibration.pdf) was operated and calibrated in the monitoring period of 14/03/2008 – 31/12/2008, so this issue is closed.</p> <p>4. Calibration certificate of Biogas flow meter to quantify total amount of landfill gas captured (FL02) (P08-0238C.pdf and RKT-0709036.pdf) was operated and calibrated in the monitoring period of 14/08/2008 – 31/12/2008, so this issue is closed.</p> <p>5. Calibration certificate of Biogas flow meter to quantify amount of landfill gas flared (FL01) (RKT-0809045.pdf) was operated and calibrated in the monitoring period of 25/09/2008 – 31/12/2008, so this issue is closed.</p> <p>6. Calibration certificate of Biogas flow meter to quantify amount of landfill gas combusted in power plant (FL03) (RKT-0809044.pdf) was operated and calibrated in the monitoring period of 25/09/2008 – 31/12/2008, so this issue is closed.</p> <p>7. Calibration certificate of Gas detector (GA02) cannot find the attached file that referred to E080003.pdf, so this issue is not closed.</p> <p>8. Calibration certificate of Temperature controller (TE03) (T-0807154.pdf) was not operated and calibrated covering with the monitoring period 14/03/2008 – 21/07/2008 but it was not in used in that period, please provide the documental evidence to confirm that this equipment did not used at that time. And the serial no. of equipment between calibration certificate and monitoring report are not consistency, please justify, so this issue is opened.</p> <p>9. Calibration certificate of Temperature controller (TE01) (T-0710080.pdf) was not operated and calibrated covering with the monitoring period 14/03/2008 – 31/12/2008 but it was not used in that period. Therefore, please provide the documental evidence to confirm that this equipment did not used at that time, so this issue is opened.</p> <p>10. Calibration certificate of Pressure transmitter (PR03) (P08-0239C.pdf) was not operated and calibrated covering with the monitoring period 14/03/2008 – 13/08/2008 but it was not in used in that period, please provide the documental evidence to confirm that this equipment did not used at that time. And the serial no. of equipment between calibration certificate and monitoring report are not consistency, please justify, so this issue is opened.</p> <p>11. Calibration certificate of Pressure transmitter (PR01) (CAL0069-07Q0077.pdf) was not operated and calibrated covering with the monitoring period 14/03/2008 – 31/12/2008 but it was not used in that period. Therefore, please provide the documental evidence to confirm that this equipment did not used at that time, so this issue is opened.</p> <p>12. Calibration certificate of Methane content analyzer (GA01) (GM07309_1-1317 and GM07309_1-2367) was operated and calibrated in the monitoring period of 14/03/2008 – 12/05/2008, so this issue is closed.</p>	
Reasoning for not Acceptance or Acceptance and Close Out:	Date: 09/08/2009
CL 03 is opened because equipments 8-11 need more clearly information and documental evidence to confirm that this equipment did not used at that time. And also recheck the serial no. that is referred between the calibration certificate and the monitoring report are not consistency.	
Project Participant Response:	Date: 15/10/2009

<p>Please find the clarification on equipment 8-10 as following;</p> <p>8. The calibration certificate of TE-01 (T-0710080.pdf) is submitted as an evindece to confirm that TE-03 was not used in period 14/03/2008 – 21/07/2008. It is also indicated in the calibration detail (Calibration Detail.xls) the period that each equipment has been used as per attachment.</p> <p>There was a typo in the monitoring report. The title should be changed from “Serial No.” to “ID No.” as this device is comprised of temperature controller and probe, which has no serial no. The ID No. in the monitoring report is derived from the calibration certificate. The title has been reconciled.</p> <p>9. TE-01 was used in the period 24/10/2007- 21/07/2008 and 30/12/2008-31/12/2008 and TE-03 was used in the period of 22/07/2008- 31/12/2008. Please see the calibration certificate of TE-01 (T-0710080.pdf), (T08-0674C.pdf) and TE-03 (T-0807154.pdf) and note that the attached calibration detail (Calibration Detail.xls) indicate the period of each equipment that has been used.</p> <p>10. PR-03 was used in the period of 02/08/2008 – 31/12/2008. Please see the calibration certificate of PR-03 (P08-0239C.pdf). Please also see the calibration detail (Calibration Detail.xls) which indicate the period of each equipment that has been used as per attachment.</p> <p>There was a typo in PR-03 serial no. provided in the monitoring report. It was reconciled referring to the calibration certificate. Please find attached the revised Monitoring Report</p> <p>11. PR-01 was used in the period 03/08/2007-01/08/2008 and 30/12/2008-31/12/2008. Please see the calibration certificate of PR-01 (CAL0069-07Q0077.pdf) and (P08-0550C.pdf). Please also see the calibration detail (Calibration Detail.xls) which indicates the period of each equipment that has been used as per attachment.</p> <p>Note : The alternate operation of pressure transmitters (PR-01, PR-02, PR-03) and temperature controllers (TE-01, TE-02, TE-03) are provided in the calibration details.</p>	
Documentation Provided by Project Participant:	
<ul style="list-style-type: none"> • Calibration Certificate [File Name: T-0710080.pdf, T08-0674C.pdf, T-0807154.pdf, , P08-0239C.pdf, CAL0069-07Q0077.pdf ,P08-0550C.pdf] • Calibration Details.xls • JS Monitoring Report Rev.03_2009 10 15.doc [Page 14 Section 2.3.4 VIII] 	
Information Verified by Lead Assessor:	
<p>Clarification on the gap period which are not covered by the calibration certificate is found satisfactory, also the supporting documents of the equipment used in the monitoring period.</p> <p>The revised monitoring report has been verified on the mismatch information that found corrected.</p>	
Reasoning for Acceptance and Close Out:	Date: 11/11/2009
CL03 is closed as the clarification is appropriate justification and supporting documents has been verified.	
Acceptance and Close out by Lead Assessor:	Date: 11/11/2009

Date:	01/07/2009	Raised by:	Assessment Team		
Type:	CL	Number:	04	Reference:	MR
Lead Assessor Comment:			Date: 01/07/2009		
<u>Cross Reference of the monitoring parameters</u> There is no information for the cross reference monitoring parameters, please substantiate how the monitoring parameters can be cross-reference with documentary evidence to proof that data reported in MR calculation sheet is correct and reliable. a) Total amount of electricity exported out of the project boundary, EL _{EX,LFG} b) Total amount of gross electricity generation					
Project Participant Response:			Date: 31/07/2009		
a) Total amount of electricity exported out of the project boundary, EL _{EX,LFG} that is used in the Monitoring Report calculation sheet is cross-referenced with the electricity statement from MEA per attached. b) Total amount of gross electricity generation is cross-referenced with the operation records as attached.					
Documentation Provided as Evidence by Project Participant:					
a) Electricity Statement from MEA (File name : 0351, 0451, 0551, 0651, 0751, 0851, 0951,1051,1151,1251) b) Operation records (File name : Gross Electricity Log Sheet)					
Information Verified by Lead Assessor:					
a) The attached file of electricity statements from MEA can shown that this information can be cross reference monitoring parameter with the total amount of electricity exported out of the project boundary, EL _{EX,LFG} to prove that data reported in MR calculation sheet is correct and reliable, so this issue is closed . b) The operation records that attached in this file cannot be used for cross-referenced with the total amount of gross electricity generation. Please provide the documentary evidence about the energy balance and how to calculate for cross-referenced of this parameter.					
Reasoning for not Acceptance or Acceptance and Close Out:			Date: 09/08/2009		
The documentary evidence of energy balance from the LFG used in project activity should be provided for the cross-reference for gross electricity generation, therefore CL 04 is opened.					
Project Participant Response:			Date: 15/10/2009		
Please find JS Gas Engine Technical Data and calculation sheet for cross- referenced with gross electricity generation as per attached.					
Documentation Provided by Project Participant:					
• JS Gross electricity generation cross-referenced Rev.00.xls					
Information Verified by Lead Assessor:					
Energy balance spreadsheet has been obtained which the figure used in the calculation sheet are supportively with objective evidence. The energy balance is comparing along the design specification and actual monitored information onsite that there are the differentiate less than 8% by the major factor on methane concentration (Actual & Design Criteria).					
Reasoning for Acceptance and Close Out:			Date: 11/11/2009		
CL04 is closed due to the energy balance of biogas utilization has been provided for cross checking and found reasonable.					
Acceptance and Close out by Lead Assessor:			Date: 11/11/2009		

Date:	01/07/2009		Raised by:	Assessment Team	
Type:	CL	Number:	05	Reference:	MR
Lead Assessor Comment:				Date: 01/07/2009	
<u>Regulatory requirements relating to landfill gas projects</u> Please elaborate how the regulatory requirements relating to landfill gas projects have been monitored and up to date on yearly basis. Also, kindly provide the list of landfill regulation related.					
Project Participant Response:				Date: 31/07/2009	
1. Please find the Landfill gas regulatory monitoring procedure as attached 2. Currently, there are no regulatory requirements relating to landfill gas projects as shown in the attached documents. 3. Related regulation on landfill and regulatory monitoring procedure is also attached.					
Documentation Provided as Evidence by Project Participant:					
1. Landfill Gas Regulatory Monitoring Procedure 2. Landfill Gas Regulations (Please see page 2/4 paragraph 2) 3. Landfill Regulatory Requirement List					
Information Verified by Lead Assessor:					
The Landfill gas regulatory monitoring procedure aimed to establish the guidance to monitoring and collect all regulatory requirement related to landfill by OPD manager. All related regulation on landfill gas project list have been evidenced on the attached file (Microsoft Excel-Landfill Regulatory Requirement List). However, as currently there are no regulatory or contractual requirements for landfill gas collection or combustion.					
Reasoning for not Acceptance or Acceptance and Close Out:				Date: 09/08/2009	
CL 05 is closed due to all of regulatory requirement that relating to landfill gas projects and also the monitoring procedure have already mentioned on the attached file of this issue.					
Acceptance and Close out by Lead Assessor:				Date: 09/08/2009	

Date:	01/07/2009	Raised by:	Assessment Team		
Type:	CAR	Number:	06	Reference:	MR
Lead Assessor Comment:		Date: 01/07/2009			
Monitoring Equipments The following of the monitoring equipments reported in monitoring report are not matching with the list of monitoring equipment and equipments installed on site. Please justify.					
Monitoring Equipment		Monitoring Report		List of Monitoring Equipments and Equipment Installed	
Gas Flow Transmitter No.1 (FL-01)		S/N: N1 – U013-959905		S/N: N1- T110-9491336	
Gas Flow Transmitter No.3 (FL-03)		S/N: N1- T110-9491336 Max Measurement range : 800		S/N: N1 – U013-959905 Max Measurement range : 1,000	
Temperature Controller (TE-03)		SN: T08151/PT08113		SN: T08151/PT08133	
Pressure Transmitter (PR-01&03)		Model: ADZ-SML-10.0-1		Model: ADZ-SML-10.0	
Pressure Transmitter (PR03)		Reference : III		Reference : VIII	
Portable Gas Analyzer (GA01)		Reference : X		Reference :XI	
Project Participant Response:		Date: 31/07/2009			
It was found that only pressure transmitter installed onsite is mismatched with the list of monitoring equipment submitted to SGS. It was reconciled accordingly.					
Documentation Provided as Evidence by Project Participant:					
JS Monitoring Report Rev.02 [Page 14 Section 2.3.4 VI]					
Information Verified by Lead Assessor:					
1. The Serial No. of Gas Flow Transmitter No.1 (FL-01) that is referred in monitoring report is already matched with the list of monitoring equipment and equipments installed on site, so this issue is closed. 2. The Serial No. and the Max Measurement range of Gas Flow Transmitter No.3 (FL-03) that are referred in monitoring report is not matched with the list of monitoring equipment and equipments installed on site, so this issue is opened. 3. The Serial No. Temperature Controller (TE-03) that is referred in monitoring report is already matched with the list of monitoring equipment and equipments installed on site, so this issue is closed. 4. The Model of Pressure Transmitter (PR-01&03) that is referred in monitoring report is not matched with the list of monitoring equipment and equipments installed on site, so this issue is opened. 5. The reference of Pressure Transmitter (PR03) that is referred in monitoring report is already matched with the list of monitoring equipment and equipments installed on site, so this issue is closed. 6. The Serial No. of Portable Gas Analyzer (GA01) that is referred in monitoring report is already matched with the list of monitoring equipment and equipments installed on site, so this issue is closed.					
Reasoning for not Acceptance or Acceptance and Close Out:		Date: 09/08/2009			
Please correct the data mismatch of the Serial No. and the Max Measurement range of Gas Flow Transmitter No.3 (FL-03) and the Model of Pressure Transmitter (PR-01&03) which is mentioned on monitoring report revise.02 due to CAR 06 is opened.					
Project Participant Response:		Date: 15/10/2009			
1. - The Max Measurement range of Gas Flow Transmitter No.3 (FL-03) has been reconciled. - There was a typo in the serial no. of (FL-03) that is referred in the list of monitoring equipment and equipments installed on site. The serial no. of FL-03 in the monitoring report is referred from FL-03 calibration certificate. 4. The Model of Pressure Transmitter (PR-01) that was referred in the monitoring report has been reconciled					
Documentation Provided by Project Participant:					
<ul style="list-style-type: none"> JS Monitoring Report Rev.03_2009 10 15.doc [Page 14 Section 2.3.4 VIII] 					
Information Verified by Lead Assessor:					
Correction in the revised monitoring report has been verified which found consistent.					
Reasoning for Acceptance and Close Out:		Date: 11/11/2009			

CAR06 is closed as found satisfactory in the revised monitoring report that the mismatching data has been corrected.

Acceptance and Close out by Lead Assessor:

Date: 11/11/2009

Date:	01/07/2009		Raised by:	Nattrin Thunsiri							
Type:	CAR	Number:	07	Reference:	MR						
Lead Assessor Comment:				Date: 01/07/2009							
<p><u>Data Mismatch of Gross Electricity Generation</u> Data mismatch of the gross electricity generation was found when verified monitoring spreadsheet against the plant record, please justify.</p> <table border="1"> <thead> <tr> <th>Period</th> <th>Monitoring Spreadsheet (KWh)</th> <th>Monthly Summary table (KWh)</th> </tr> </thead> <tbody> <tr> <td>November 2008</td> <td>571,000</td> <td>571,680</td> </tr> </tbody> </table> <p>Also, the gross electricity generation in March 2008 is reported for the whole month (March 01 – 31, 2008) while the monitoring period is claimed for March 14 – 31, 2008. Please correct.</p>						Period	Monitoring Spreadsheet (KWh)	Monthly Summary table (KWh)	November 2008	571,000	571,680
Period	Monitoring Spreadsheet (KWh)	Monthly Summary table (KWh)									
November 2008	571,000	571,680									
Project Participant Response:				Date: 31/07/2009							
There was a typo in the gross electricity generation and the data has been reconciled accordingly. Further examination is provided in the attached document.											
Documentation Provided as Evidence by Project Participant:											
Annex 3.4 ERC- Emission Reduction Calculation Rev.03_2009 07 31 Sheet Electricity export import											
Information Verified by Lead Assessor:											
As show in the attached file, the gross electricity generation on November 2008 of monitoring spreadsheet is matched with the plant record and also using the monitoring period of the gross electricity generation for March 14 – 31, 2008.											
Reasoning for not Acceptance or Acceptance and Close Out:				Date: 09/08/2009							
CAR 07 is closed because all information has been corrected.											
Acceptance and Close out by Lead Assessor:				Date: 09/08/2009							

Date:	01/07/2009		Raised by:	Assessment Team	
Type:	CAR	Number:	08	Reference:	MR
Lead Assessor Comment:				Date: 01/07/2009	
<p><u>Data Mismatch of Electricity Exported to Grid</u> The electricity exported to grid in March 2008 is reported for the whole month (March 01 – 31, 2008) while the monitoring period is claimed for March 14 – 31, 2008. Please correct. Furthermore, it has mentioned in the monitoring report version 01 dated April 2009 that the electricity was exported to the MEA however inconsistency information was found in monitoring spreadsheet as it mentioned to PEA. Kindly justify.</p>					
Project Participant Response:				Date: 31/07/2009	
<p>The electricity exported to grid in March 2008 has been corrected in accordance with SGS findings presented above. PEA is corrected to MEA in the monitoring spreadsheet accordingly.</p>					
Documentation Provided as Evidence by Project Participant:					
Annex 3.4 ERC- Emission Reduction Calculation Rev.03_2009 07 31 Sheet Electricity export import					
Information Verified by Lead Assessor:					
<p>The data mismatch of electricity exported to grid on march, 2008 is corrected for the time period of March 14 – 31, 2008. For the monitoring spreadsheet, the electricity was exported to the MEA that is consistency with in the monitoring report.</p>					
Reasoning for not Acceptance or Acceptance and Close Out:				Date: 09/08/2009	
CAR 08 is closed due to correction in the attached spreadsheet which is consistency with the monitoring report.					
Acceptance and Close out by Lead Assessor:				Date: 09/08/2009	

Date:	01/07/2009	Raised by:	Assessment Team		
Type:	CAR	Number:	09	Reference:	MR
Lead Assessor Comment:			Date: 01/07/2009		
Monitoring Parameters					
The units of monitoring biogas meters reported in monitoring spreadsheet (Nm3) is not in line with the applied methodology and approved monitoring plan (m3), please justify.					
In addition, please elaborate the unit conversion of biogas flow has been converted.					
Project Participant Response:			Date: 31/07/2009		
There had actually been a misunderstanding about the unit of biogas volumetric flow, i.e. the unit previously presented as “Nm3”(normal cubic meter) in the monitoring spreadsheet is in fact already corrected to “m3” (cubic meter)					
Please understand that these values are derived from using the values measured at the operating conditions thus multiplied by the correction-factor. The correction-factor eliminates “error” that is occurred while a volumetric flow rate is measured at an “actual” operating pressure and temperature that vary from the ”design” operating pressure and temperature of the monitoring devices.					
Please find attached the flow correction method and the sample calculation of flow correction.					
As clarified above, “volumetric flow rate correction” but not “unit coversion” is submitted. The unit of biogas in monitoring spread sheet has also been reconciled.					
Documentation Provided as Evidence by Project Participant:					
2 . Flow correction method					
3 . Sample calculation of flow correction					
Information Verified by Lead Assessor:					
The unit that presented in the monitoring spreadsheet is already corrected to m ³ (cubic meter). And the volumetric flow rate correction is calculated as shown in this attached document.					
However there are mismatch in the unit report for biogas quantity in calculation spreadsheet.					
Reasoning for not Acceptance or Acceptance and Close Out:			Date: 09/08/2009		
CAR 09 is opened due to the unit of biogas quantity reported in the calculation spreadsheet is mismatch with the actual unit indicated, please justify.					
Project Participant Response:			Date: 15/10/2009		
In the “Comment” column of ID Number “7” [T, i.e. temperature] and “8” [p, i.e. pressure] in page 9, ACM0001 Version05, it is stated that “normalized cubic meter (Nm3)” is to be applied for the unit of LFG. The standard temperature and pressure (STP) referred in ACM0001 Version05are 0 degree Celsius and 1.013 bar (equivalent to 101.3kPa, 1 atm.)					
The conversion of volumetric flow (Nm3) to STP causes the emission reduction decreased by 16% compare to previous calculation.					
Please find attached the procedure to derive volumetric flow (Nm3) at STP and revised emission reduction calculation sheet.					
Documentation Provided by Project Participant:					
Procedure_Volumetric flow correction and conversion Rev.00.doc					
Annex 3.4 ERC- Emission Reduction Calculation Rev.03_2009 10 15.xls					
Information Verified by Lead Assessor:					
Unit reporting for the biogas in project activity has been revised which calculation method revises by the information indicated as manual of the flow meter					
Monitoring report and the calculation sheet have been reviewed and found satisfactory in the unit reporting					
Reasoning for not Acceptance or Acceptance and Close Out:			Date: 11/11/2009		
CAR09 is closed as the unit reporting is consistent with the actual condition that the biogas quantity reported.					
Acceptance and Close out by Lead Assessor:			Date: 11/11/2009		

Date:	08/01/2010		Raised by:	Assessment Team	
Type:	CAR	Number:	10	Reference:	TR
Lead Assessor Comment:					
<u>Ex-ante and Ex-post Comparison</u>					
<p>Comparison of the actual emission reduction claimed in the monitoring period with the estimate in the registered PDD need to be provided. As required by EB48 Annex 68 para10 a(viii) And also explanations on any significant change in the emission reduction need to be discussed in the monitoring report.</p>					
Project Participant Response:				Date: 03/02/2010	
Explanation on the change in the emission reduction is provided in the revised monitoring report per attached.					
Documentation Provided by Project Participant:					
JS Monitoring Report Rev.04, page 27					
Information Verified by Lead Assessor:					
<p>The description between actual emission reduction claimed in the monitoring period and estimate in the register PDD have been already mentioned in the monitoring report version 4 but some information and some parameter are not clearly enough as followed below:</p> <ol style="list-style-type: none"> As mentioned in the summary table, monitoring report version 4, the period covered by the current monitoring report mentioned in 9.5 months that is not consistent with paragraph under this table which 12 months is indicated, Also calculation in the ex-ante estimation should be reported in the calculation spreadsheet. There are some inconsistency information as mentioned in the Table (section 3.4 of monitoring report version 4) shall be corrected and justified as follow: <ul style="list-style-type: none"> Unit of $CEF_{thermal}$ should be corrected in $tCO_2\ e/TJ$. Unit of $CEF_{electricity}$ as mentioned in spreadsheet (emission reduction equation) should be corrected in $tCO_2\ e/ MWh$. The actual value of flare operation parameter as mentioned for 0 min/hr, so please justify that this value has been measure in the real action or the real value only not more than 20 min/hr. The Unit of $PE_{flare,y}$, $LFG_{total,y}$, and $MD_{electricity,y}$ should be mentioned in this table. The explanation in section 3.4 (monitoring report, version 4) of the emission reduction decreased is not clearly enough, please justify why the emission reduction is decreased although the value about $LFG_{electricity}$ and LFG_{flare} are not followed the forecast as mentioned in the VCS PDD (20% of total LFG would be utilized for electricity generation and the rest for the flaring). The final result of ER should be reported in Integer number by round down the decimal. In other hand, the value reported in table under section 3.4 should report by consistent along two columns which can be comparing the different along these two scenarios. (three points of decimal is not appropriate for reporting) 					
Reasoning for not Acceptance or Acceptance and Close Out:				Date: 05/04/2010	
CAR 10 is opened due to all information above shall be justified and corrected in the monitoring report.					
Project Participant Response:				Date: 23/04/2010	

1. The monitoring period indicated in Item 6 of Summary Table in Monitoring Report has been corrected to 9.5 from 12 months to make it consistent with the ex-post monitoring period. The ex-ante estimation referred from registered PDD has already been reported in the calculation spreadsheet.
2. The inconsistent information in the table in Section 3.4 of Monitoring Report have been corrected as follows:
 - Unit of $CEF_{thermal}$ has been corrected to "tCO₂ e/TJ"
 - Unit of $CEF_{electricity}$ has been corrected to "tCO₂ e/ MWh"
 - Flame detector detected the flame at the flaring system and sent the signal to the monitoring station. However, in real operation, the flame has never been ignited so that there was no flame at the flame detector.
 - The Unit of $PE_{flare,y}$, $LFG_{total,y}$, and $MD_{electricity,y}$ have been mentioned in the table in Section 3.4 of Monitoring Report
 - The decrease in the claimed emission reduction is mainly due to the difference between the amount of LFG collected and LFG flared ex-post and those of estimated ex-ante. In the registered PDD, it was forecasted that about 23% of total LFG would be utilized for the electricity generation and the rest 77% for the flaring, whereas under the actual operation, there was no LFG that was flared. The monitored methane content that was adopted for ex-post calculation is lower than ex-ante estimated value. The lower methane content, the more LFG flow sent to gas engine. This contributed to the increase in ex-post amount of LFG utilized for electricity generation compared to that of ex-ante.
 - The result of emission reduction has been rounded. The consistency of the decimal number of both two columns has been rectified.

Documentation Provided by Project Participant:

Annex 3.4 ERC- Emission Reduction Calculation Rev.05
JS Monitoring Report Rev.05

Information Verified by Lead Assessor:

1. As mentioned in the monitoring report version 5 on summary table in section 1.2, the monitoring period has been corrected in 9.5 months which is consistent of all information as mentioned in the monitoring report and spreadsheet. Also the ex-ante estimation calculation has been reported in the calculation spreadsheet version 5, so this issue is closed out.
2. All issues as mentioned in section 3.4 (Table for comparison of the actual and estimated emission reduction in the register PDD), version 5, are closed out as mentioned below:
 - Unit of $CEF_{thermal}$ has been corrected in tCO₂ e/TJ.
 - Unit of $PE_{flare,y}$ and $MD_{electricity,y}$ have been already mentioned in this table.
 - The actual value of flare operation parameter as mentioned in 0 min/hr has been clearly explained that no flame was detected at the flame detector in each hour.
 - The explanation of emission reduction decreased has been elaborated with all information in section 3.4 (including with table for comparison between actual and estimated emission reduction) that no flame detected from flare.
 - The emission reduction value has been reported in the integer number by round down the decimal and both columns can be compared in the same way.

Reasoning for not Acceptance or Acceptance and Close Out:

Date: 30/05/2010

However, CAR 10 is opened due to some information still not be correct as below:

- The unit of $CEF_{electricity}$ as mentioned in spreadsheet (sheet JS Annual ER comparison (Row 6) and JS Annual ER 08 (Row 4)) should be corrected in the unit of tCO₂ e/MWh.
- The unit of $LFG_{total,y}$ as mentioned in monitoring report version 5, table section 3.4, should be rechecked again (it should be in m³).
- Also the unit of $LFG_{electricity}$, LFG_{flare} and $LFG_{thermal}$ are incorrect reporting. Unit of density (item 18&25) should be adjusted to mass per Nm³

Project Participant Response:

Date: 04/06/2010

<p>-The unit of CEF_{electricity} as mentioned in spreadsheet (sheet JS Annual ER comparison (Row 6) and JS Annual ER 08 (Row 4)) have been corrected to "tCO₂ e/MWh".</p> <p>- The unit of LFG_{total,y} in the table under section 3.4 of the Monitoring Report has been checked and corrected to "m³"</p> <p>- The unit of LFG_{electricity}, LFG_{flare} and LFG_{thermal} (item 14,15 and 16) in the table under section 3.4 of the Monitoring Report have been edited to show the value of LFG in "m³" at 15c,1.01325 bar and in "Nm³" at STP referred in ACM0001 Version05 (0c, 1.01325 bar). The unit of density (item 18&25) has been edited to be mass per Nm³</p>	
Documentation Provided by Project Participant:	
Annex 3.4 ERC- Emission Reduction Calculation Rev.06 JS Monitoring Report Rev.06	
Information Verified by Lead Assessor:	
<p>- The unit of CEF_{electricity}, as mentioned in revised spreadsheet, has been corrected in tCO₂ e/MWh, so this issue is closed.</p> <p>- The unit of LFG_{total,y}, as mentioned in monitoring report version 6, has been corrected. So this issue is closed.</p> <p>- The unit of LFG_{electricity}, LFG_{flare}, LFG_{thermal} and density (item 18&25) have been corrected, so this issue is closed.</p>	
Reasoning for not Acceptance or Acceptance and Close Out:	Date: 14/06/2010
CAR 10 is closed out because of the unit of all parameter have been corrected.	
Acceptance and Close out by Lead Assessor:	Date: 14/06/2010

Date:	08/01/2010	Raised by:	Assessment Team		
Type:	CAR	Number:	11	Reference:	TR
Lead Assessor Comment:					
<u>Calibration detail</u>					
<p>The MR doesn't provide the any information for the calibration record as required by EB48 Annex 68 para 10 a (III)viz.</p> <ol style="list-style-type: none"> 1. Calibration certificate number 2. Date of calibration 3. And validity of certificates of the monitoring equipments. <p>To follow EB48 Annex 68 para 10 (iii) all the parameters should be reported in line to MP of registered PDD and applied methodology. The PDD requires the monitoring of LFG continuously but only hourly readings are reported in spread sheet of ER which cannot be categorized as continuous.</p> <p>Justification on the calibration frequency need to be more clarified as the registered PDD indicated that device will be calibrated as per manufacturing specification.</p>					
Project Participant Response:				Date: 03/02/2010	
<p>In accordance with EB48 Annex 68 para 10 (iii), the calibration certificate number, date of calibration and the monitoring equipments are reported in the monitoring report as attached. Please note that normally each of calibration certificates does not indicate its validity therefore the calibration frequency of monitoring devices are conducted according to manufacturer specification/supplier's recommendation.</p> <p>According to the registered PDD, LFG was continuously monitored with recording frequency at five-second interval from the beginning of the monitoring period. The recording frequency was then adjusted to one-minute interval since 5 August 2008 while the gas was continued to be continuously monitored. The monitored data were aggregated to hourly values for the sake of emission reduction calculation as provided in the attached spreadsheet.</p> <p>The calibration frequency of measurement equipments from suppliers are provided in the attached document.</p>					
Documentation Provided by Project Participant:					
<p>JS Monitoring Report Rev.04, Page 20-23 Calibration Frequency from equipment's supplier;</p> <ol style="list-style-type: none"> 1. Gas Flow Meter (Device ID FL-01, FL-02,FL-03) : NRT-Rajathewa-069-2010[1].pdf 2. Fixed Type Gas Analyzer (Device ID GA-02: IR600.pdf, page 18 section 5.0 Calibration. 3. Temperature Controller with PT100 (Device ID TE-01,TE-02,TE-03) : PT100.pdf 4. Pressure Transmitter (Device ID PR-01,PR-02, PR-03) : Pressure trans letter.pdf 5. Electricity Meter (Meter No. PK-201103 : ALPHA Plus meter Technical Manual.pdf, page 6-2 					
Information Verified by Lead Assessor:					

- The calibration certificate number, date of calibration, and calibration frequency have been elaborated in the revised monitoring report version 4 (section 2.4.2), however, there are some point should be corrected or justified as mentioned below.
 - Date of both calibration certificate for FL-01, device ID No. III, (as mentioned on 18/09/2007 & 13/09/2008) are not consistent with documentary evidence (as mentioned as 18/09/2008 & 26/09/2007 on calibration certificate).
 - Date of calibration certificate for TE-01, device ID No. VI, (as mentioned on 24/10/2007) is not consistent with documentary evidence (as mentioned on 18/10/2007).
 - No. of calibration certificate for PR-01, device ID No. IX, (as mentioned in 08P2) is not consistent with documentary evidence (as mentioned in P08/0550C).
- Some documentary evidence of calibration certificate as mentioned in section 2.4.2 are not yet obtained as followed:
 - Calibration certificate No. E08003, device ID No. IV (GA-02).
 - Calibration certificate No. T-0801059, device ID No. VII (TE-02).
 - Calibration certificate No. P08/0239C, device ID No. IX (PR-02).
- As mentioned in section 2.3.6, why the device ID No. VII is mentioned the equipment only TE-02 but another section are mentioned both of TE-01 and TE-02,
- As mentioned in section 2.3.4, the model of device ID No. III (FL-03) is not the same with documentary evidence (7MF4433-1BA22-146-Z), please correct.
- The information of LFG has been report in the revised spreadsheet Rev. 4 in continuous monitored hourly, but this issue still pending with CL 13.

Reasoning for not Acceptance or Acceptance and Close Out:

Date: 05/04/2010

CAR 11 is open due all information above needed to be justified and provided with documentary evidence.

Project Participant Response:

Date: 23/04/2010

3. The date of calibration of device ID FL-01, TE-01 has been corrected to be consistent with documentary evidence.
 - The calibration certificate No. of device ID PR-01 is "P08/05550C". The number of certificate in the monitoring report has been corrected.
4. The calibration certificate for the following devices has been attached herewith.
 - Calibration certificate No. E08003, device ID No. IV (GA-02).
 - Calibration certificate No. T-0801059, device ID No. VII (TE-02).
 - Calibration certificate No. P08/0239C, device ID No. IX (PR-02).
5. Section 2.3.6, there was a typo of device ID TE-02. It has been rectified.
6. Section 2.3.4, there was a typo of the model of device ID No. III (FL-03). It has been corrected.
7. Response is presented in CL13.

Documentation Provided by Project Participant:

Calibration Certificate;
GA-02 (file name: E08003.pdf)
TE-02 (file name: T-0801059.pdf)
PR-02 (file name: P08_0239C.pdf)

Information Verified by Lead Assessor:

- All issue below has been closed out due to the information already provided.
1. Date of calibration certificate for FL-01 (as mentioned on 26/09/2007), TE-01 (as mentioned on 24/10/2007) and also no. of calibration certificate for PR-01 have been corrected to according with documentary evidence.
 2. The calibration certificate of GA-02 and TE-02 has been already obtained.
 3. As mentioned in section 2.3.6, the device ID TE-02 has been mentioned.
 4. As mentioned in section 2.3.4, the model of device ID FL-03 has been corrected to according with documentary evidence.
 5. This issue also closed out with the corrected information in CL 13.

Reasoning for not Acceptance or Acceptance and Close Out:	Date: 30/05/2010
<p>CAR 11 still opened because some information below needs to provide and correct.</p> <p>1. Date of calibration certificate, device ID FL-01, is not consistent with documentary evidence (calibration certificate no. RKT-080904 as mentioned the date on 18/09/2008), please correct.</p> <p>2. Calibration certificate of PR-02, calibration certificate no. 08P2, date 02/01/2008 should be provided with documentary evidence.</p>	
Project Participant Response:	Date: 04/06/2010
<p>1. The date of calibration of the device ID FL-01 in the monitoring report has been corrected to be consistent with documentary evidence (Certificate No. RKT-0809045, date of calibration- 18/09/2008).</p> <p>2. Calibration certificate of PR-02(calibration certificate No. P0802) is attached.</p>	
Documentation Provided by Project Participant:	
Calibration certificate of PR-02 (file name: P0802.pdf)	
Information Verified by Lead Assessor:	
<p>1. Date of calibration certificate of FL-01 (Gas Flow Meter) has been corrected according with certificate number RKT-0809045, date of calibration- 18/09/2008, so this issue is closed.</p> <p>2. Calibration certificate number P0802 of PR-02 (Pressure Transmitter) has been obtained, so this issue is closed.</p>	
Reasoning for not Acceptance or Acceptance and Close Out:	Date: 14/06/2010
CAR 11 is closed out due to the calibration certificate have been corrected according with documentary evidence.	
Acceptance and Close out by Lead Assessor:	Date: 14/06/2010

Date:	08/01/2010	Raised by:	Assessment Team		
Type:	CAR	Number:	12	Reference:	TR
Lead Assessor Comment:					
<u>Unit Reporting</u>					
<p>All the parameters should be reported in the spread sheet the same way as mentioned in the registered PDD. Please also refer EB26 para 109 & EB38 annex 22 para 5.</p> <ul style="list-style-type: none"> e) Following the MP of the registered PDD the flow of LFG (total, flare and elect) should be measured in m3 with the above referred guidance the values should be reported in m3. f) Referring to the registered PDD the amount of electricity exported will be measured in MWh but in the spread sheet it is reported in kWh. g) Please justify the values of temp are reported in K which is not inline to the registered PDD which mentioned the unit of temperature as C. Also for the pressure that Pa is the unit indicated in the registered PDD. h) Please indicate the device ID for this electricity meter and also for the meter used for power import like all others devices in the monitoring report (monitoring plan) 					
Project Participant Response:				Date: 03/02/2010	
<p>i) In the "Comment" column of ID Number "7" [T, i.e. temperature] and "8" [p, i.e. pressure] of ACM0001, version 05, it is stated that "No separate monitoring of temperature and pressure is necessary when using flow meters that automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters".</p> <p>A flow meter to express measured LFG in normalized cubic meters has been installed under the project activity. "Nm³" that was reported in the monitoring report stands for m³ of LFG monitored at the normal condition, i.e. standard temperature and pressure (STP) of 0 Celsius degree and 1.013 bar.</p> <p>Since LFG was measured in Nm³ at the supplier's standard temperature and pressure under the project activity, the project participant has converted the measured LFG in Nm³ at supplier's STP to designated STP in methodology to arrive at the LFG in m³.</p> <p>The expressing unit of the flow of LFG (collected and utilized for flaring and electricity generation) is reconciled to "m³" in accordance with the monitoring plan described in the registered PDD.</p> <p>j) The values of temperature and pressure have been respectively corrected in accordance with the registered PDD as presented in the attached calculation sheet.</p> <p>Although temperature and pressure are not required to be monitored as long as LFG is measured in Nm³, project participant continuously monitored these two parameters as indicated in the revised monitoring report and emission reduction calculation sheet.</p> <p>6. The unit of electricity exported in the monitoring spreadsheet has been reconciled to "MWh" in accordance with registered PDD.</p> <p>k) Since the electricity meter is belong to Metropolitan Electricity Authority (MEA), "MEA's meter number" is used as reference device ID. In addition, the electricity meter functions to measure both exported and imported electricity, thus there is only one meter number.</p>					
Documentation Provided by Project Participant:					
JS Monitoring Report Rev.04					
Annex 3.4 ERC- Emission Reduction Calculation Rev.04					
Information Verified by Lead Assessor:					

All parameters as mentioned in the registered PDD have been reported in the revised spreadsheet followed EB 26 para 109 & EB 38 Annex 22 para 5. But all issues as mentioned below are needed to be elaborated in more detail.

- The unit of LFG_{total} , $LFG_{electricity}$, and LFG_{flare} (as mentioned in the revised spreadsheet Rev. 4) have been already corrected in accordance with MP of the register PDD in m^3 . However, there are some issue need to be justified as follow:
 - As mentioned in spreadsheet, sheet "Summary", the unit of LGF_{total} , LGF_{flare} and LGF_{elect} that have been convert to Nm^3 unit (as mentioned in column D, F, and H) should be corrected.
 - As mentioned in spreadsheet, sheet "Summary", please provide the documentary evidence from supplier about 15°C was plus with 273.15 (for convert the unit from m^3 to Nm^3). And also please corrected the information of P_2 (E21, sheet "Summary"), it should be mentioned in 1.01325.
 - In addition, formulae indicate under section 2.2.1 is incorrect (+ : -), please correct
- As mentioned in the revised spreadsheet (Rev. 04), the unit of electricity exported has been already changed from kWh to MWh that is also consistent with the register PDD, so this issue is closed.
- The unit of temperature and pressure have been changed to according with the registered PDD as mentioned in revised spreadsheet rev. 04, so this issue is closed.
- The electricity meter function for import and export are the same with device ID and controlled by metropolitan Electricity Authority (MEA), so this issue is closed.

Reasoning for not Acceptance or Acceptance and Close Out:

Date: 05/04/2010

CAR 12 is still open as point No.1

Project Participant Response:

Date: 23/04/2010

- Please find the response as follow;
 - In the spreadsheet "Summary", the unit of LFG_{total} , $LFG_{electricity}$ and LFG_{flare} presented in column D, F, and H have been corrected to " Nm^3 ".
 - The documentary evidence from supplier to substantiate the supplier's specification on temperature and pressure is attached. The information of P_2 (column E21 in sheet "Summary") has been corrected to 1.01325
 - No typo in the emission reduction formulae hence no correction was made.

Documentation Provided by Project Participant:

Annex 3.4 ERC- Emission Reduction Calculation Rev.05
JS Monitoring Report Rev.05
NRT-Rajathewa-1298[confirmation letter].pdf

Information Verified by Lead Assessor:

- The unit of LGF_{total} , LGF_{flare} and LGF_{elect} have been already corrected to Nm^3 as mentioned in the revised spreadsheet version 5, so this issue is closed.
- The confirmation letter from supplier (Gas Flow Meter) has been obtained to justify the temperature and pressure specification for gas flow rate calculation. Also the information of P_2 has been corrected in 1.01325 bars (as mentioned in E21 sheet "Summary").

Reasoning for not Acceptance or Acceptance and Close Out:

Date: 30/05/2010

CAR 12 is closed out due to all issue above has been corrected.

Acceptance and Close out by Lead Assessor:

Date: 30/05/2010

Date:	08/01/2010	Raised by:	Assessment Team		
Type:	CL	Number:	13	Reference:	TR
Lead Assessor Comment:					
<p><u>Explanation on daily monitoring</u></p> <p>No explanation has been given why there is no flow of gas for several days for eg from 11/09/2008 to 20/09/2008. Thus please indicate the reason on each day where no the monitoring value reported.</p> <p>Also please explain on how the monitored data are reported as negative value in the SCADA system for LFG flow.</p> <p>Please more clarify in the monitoring report about the method used for estimate PE_{flare} during monitoring period (actual monitoring on the flare efficiency or default value from the flaring tools is applied). Then clarify on the related parameter to calculate emission reduction.</p>					
Project Participant Response:				Date: 03/02/2010	
<p>1. "Top end overhaul" was carried out from 11/09/2008 to 20/09/2008. Explanation why no flow of gas was not reported for several days are provided in the revised calculation spreadsheet. Moreover, due to the fault in transmission and distribution system of MEA, the engine was unexpectedly stopped, which led to the variance of the amount of LFG flow and other monitored parameters.</p> <p>2. While power plant was shutdown, the flow meter detected flow of gas where in fact there was no LFG flow through flow meter. This caused the negative value of monitored data. The negative value was removed during the data processing.</p> <p>3. The method to calculate PE_{flare} is provided in the revised monitoring report as attached.</p>					
Documentation Provided by Project Participant:					
<p>JS Monitoring Report Rev.04, Page 27</p> <p>Annex 3.4 ERC- Emission Reduction Calculation Rev.04 (Monthly data sheet, Column K)</p>					
Information Verified by Lead Assessor:					
<p>1. The explanation of no flow gas in each value has been already mentioned in the revised spreadsheet Rev.4 but please clarify some abnormal value that has been reported in spreadsheet in each month, the examples are mentioned below, and also please provided the same with other value.</p> <ul style="list-style-type: none"> - As mentioned in remark, on 16/08/2008 "sheet Aug08", engine stop for weekly preventive maintenance but the information of LFG still mentioned in the spreadsheet. And why the information only 10.00-11.00 am is too low, please justify. - As mentioned in remark, sheet "Sep08" (during 11/09/2008 to 20/09/2008), as mentioned that "Top End Overhaul". Please justify why the information still reported on 11/09/2008 and 12/09/2008. - The remark in the end of each worksheet (monthly monitoring data, March08-Dec08) is inconsistent with the figure used for calculate the emission reduction (assumption of 1 atm and unit conversion of temperature). <p>2. The negative value in the SCADA occurred due to the power plant shutdown; however, all negative value has been corrected as mentioned in the revised spreadsheet Rev.4, so this issue is closed.</p> <p>3. The method of PE_{flare} calculation and related parameter has been followed tool to determine project emissions from flaring gases containing methane, so this issue is closed.</p>					
Reasoning for not Acceptance or Acceptance and Close Out:				Date: 05/04/2010	
All information above should be elaborated in more detail in point No.1, so CL 13 is still opened					
Project Participant Response:				Date: 23/04/2010	

1. Regarding the spreadsheet "Aug08", at 10:00hrs -11:00hrs on 16/08/2008, engine was stopped for weekly preventive maintenance during the said period but the erroneous data for corresponding hours were not taken out from the cells. The erroneous data in the calculation spreadsheet have been deleted, resulting in lower emission reductions.

-Preparations and performance check for the engine was conducted before the engine stop thus the engine consumed LFG and produced electricity, hence some values were monitored and recorded before it fully stopped. The further explanation has been incorporated in the remark column of the data on 11/09/2008 to 20/09/2008

- The remark at the end of each worksheet (monthly monitoring data, March08-Dec08) has been consolidated to the values used to calculate the emission reduction (assumption of 1 atm and unit conversion of temperature).

Documentation Provided by Project Participant:

Annex 3.4 ERC- Emission Reduction Calculation Rev.05

Information Verified by Lead Assessor:

- The abnormal value in each month that reported on 16/08/2008, sheet "Aug08", has been already deleted in the revised spreadsheet version 5, so this issue is closed out.
- The clarification of sheet "Sep 08" about Top End Overhaul on remark information during 11/09/2009 to 20/09/2008 have been clearly, so this issue is closed out.
- As mentioned in revised spreadsheet version 5, the remarked information as provided in each month and the information in sheet "summary" and "JS Annual ER 08" are consistent (assumption of 1 atm and temperature conversion), so this issue is closed out.

Reasoning for not Acceptance or Acceptance and Close Out:

Date: 30/05/2010

CL 13 is closed out due to all information above already corrected and clearly clarified.

Acceptance and Close out by Lead Assessor:

Date: 30/05/2010

Date:	08/01/2010	Raised by:	Assessment Team		
Type:	CAR	Number:	14	Reference:	TR
Lead Assessor Comment:					
<u>Quantity of LFG</u>					
<p>For some dates the quantity of LFG total is lesser than flared and burnt in electricity generation which is theoretically not possible. Therefore, PP should claim the minimum out of two (total or flared & electricity). For example,</p> <ul style="list-style-type: none"> - 01/06/2008 (1 PM – 3 PM) - 04/07/2008 (6 PM) - 05/07/2008 (5 PM) - 13/07/2008 (1 PM) – 16/07/2008 (4 PM) 					
Project Participant Response:				Date: 03/02/2010	
Example : The comparison table presents the data of 13/07/2008 (1 PM) – 14/07/2008 (4 PM)1					
	2	3	4	5	
Time	LFGtotal	LFGelectricity & LFGflare	LFGelectricity	LFGflare	
	m3	m3	m3	m3	
13:00:00	73.44	139.54	109.83	29.72	
14:00:00	8.61	35.92	6.11	29.80	
15:00:00	0.86	64.87	31.97	32.90	
16:00:00	0.00	95.93	60.86	35.07	
17:00:00	0.00	96.75	60.35	36.40	
18:00:00	0.00	36.89	2.01	34.88	
19:00:00	1.18	36.44	1.35	35.09	
20:00:00	70.61	101.44	66.15	35.29	
21:00:00	540.69	549.44	511.42	38.02	
22:00:00	538.16	545.13	506.96	38.17	
23:00:00	538.05	541.11	502.80	38.31	
0:00:00	538.32	550.23	512.02	38.21	
1:00:00	541.15	536.95	498.63	38.32	
2:00:00	543.23	549.22	510.41	38.81	
3:00:00	548.85	566.50	526.40	40.10	
4:00:00	551.75	564.65	524.68	39.98	
5:00:00	554.76	564.56	525.55	39.00	
6:00:00	556.67	563.41	525.49	37.92	
7:00:00	561.23	569.51	532.24	37.27	
8:00:00	303.92	309.64	290.51	19.12	
9:00:00	564.77	586.12	550.84	35.27	
10:00:00	534.47	557.57	523.36	34.21	
<p>Despite the fact the flaring system has never been activated during the monitoring period, the flow meter at the flaring system detected the flow of gas. Thus, it is assumed that no emission reduction was achieved at the flaring system (LFG_{flare}) and project participant calculated the emission reductions from the LFG utilized for the electricity generation (LFG_{electricity}). This is conservative. Furthermore, at certain times of a certain day, the flow meter to measure the gas utilized for electricity generation and flaring detected the gas flow while the flow meter to measure the total volume of gas indicated zero. In this case, the project participant regarded that no gas was collected and utilized for that period, hence zero emission reduction was achieved for the particular hours. This is also a conservative approach. This caused emission reduction decreased about 44 ton compare to previous calculation.</p>					

Documentation Provided by Project Participant:	
Annex 3.4 ERC- Emission Reduction Calculation Rev.04	
Information Verified by Lead Assessor:	
<p>The explanation that has been used to calculate the quantity of LFG as mentioned above is not clearly enough. There is some issue should be justified as mentioned below.</p> <ul style="list-style-type: none"> - As mentioned that “the flaring system has never been activated during the monitoring period, the flow meter at the flaring system detected the flow gas, so it is assumed that no emission reduction was achieved at the flaring system (LFG_{flare}) and project participate calculated the emission reductions from the LFG utilized for the electricity generation (LFG_{electricity})”, please clarify how the conservative of this paragraph. - As followed the example above (value in the table), please clarify in the conservativeness which data of LFG will be chosen for calculate the quantity of methane destroyed by the generation of electricity, if the quantity of LFG total is lesser than flared and burnt in electricity generation. Considering total LFG and LFG for electricity is not the same portion of LFG - Please kindly indicate the basis (Hourly?, Daily? or Monthly?) which the comparison on the LFG quantity is undertaken. Also please show the comparison in calculation spreadsheet. 	
Reasoning for not Acceptance or Acceptance and Close Out:	Date: 05/04/2010
CAR 14 is still opened due to the clarification of the value that has been used for calculated emission reduction should be elaborated and please clarify the conservative way of the paragraph as mentioned above.	
Project Participant Response:	Date: 23/04/2010
<p>Conservative method applied for the ex-post calculation can be justified if LFG utilized for the electricity generation is less than total LFG minus LFG flared. Solution “X” in the formula below should be positive where the LFG used for the electricity generation is less than the results which are calculated as total LFG collected minus LFG flared.</p> $X = (LFG_{total} - LFG_{flare}) - LFG_{electricity}$ <p>Project participant calculated “X” on a monthly basis and it turned out that the results are all positive. Thus, it is concluded that calculating the emission reductions from the LFG utilized for the electricity generation (LFG_{electricity}) is conservative. Calculation results are added in the revised emission reduction calculation spreadsheet.</p>	
Documentation Provided by Project Participant:	
Annex 3.4 ERC- Emission Reduction Calculation Rev.05	
The evidence from supplier regarding supplier's temperature and pressure (file name: NRT-Rajathewa-1298[confirmation letter].pdf)	
Information Verified by Lead Assessor:	
The conservative way to clarify the quantity of LFG has been mentioned above; it means that no negative X value has been reported and used for calculation the quantity of methane destroyed by electricity generation. So this issue is opened	
Reasoning for not Acceptance or Acceptance and Close Out:	Date: 30/05/2010
However, CAR 14 still open due to the comparison on LFG quantity shall be elaborated how it difference in MR.	
Project Participant Response:	Date: 04/06/2010
The clarification of the conservativeness approach for the quantity of LFG that was adopted for ex-post emission calculation has been elaborated in the monitoring report under section 2.4.4.2	
Documentation Provided by Project Participant:	
JS Monitoring Report Rev.06	
Information Verified by Lead Assessor:	
As mentioned in the revised monitoring report version 6, the comparison on LFG quantity has been elaborated in more detail, so this issue is closed.	
Reasoning for not Acceptance or Acceptance and Close Out:	Date: 14/06/2010



CAR 14 is closed out due to the clarification of quantity LFG has been already elaborated in monitoring report, version 6, section 2.4.4.2

Acceptance and Close out by Lead Assessor:

Date: 14/06/2010

Date:	08/01/2010		Raised by:	Assessment Team	
Type:	CL	Number:	15	Reference:	TR
Lead Assessor Comment:					
<p><u>Flare operation parameter</u></p> <p>Please clarify on the method used for monitor the flare operation parameter as per monitoring plan of registered PDD. And please indicate the monitored value in the monitoring report and emission reduction calculation sheet.</p>					
Project Participant Response:				Date: 03/02/2010	
<p>Project emission is calculated as per section 2.2 of the monitoring report and the registered PDD. Under the project activity, the emission from the open flaring system is counted as the project emission. As per the "Methodological Tool to determine project emissions from flaring gases containing methane" and the registered PDD, the default value of 50% was chosen as the flare efficiency. Flame detector has been installed to continuously monitor the flare operation parameter and to decide the flare efficiency, i.e. 50% or 0%. The flare operation parameter is indicated in the revised monitoring report and the revised emission reduction calculation sheet as attached.</p>					
Documentation Provided by Project Participant:					
<p>JS Monitoring Report Rev.04,Page 27 Annex 3.4 ERC- Emission Reduction Calculation Rev.04 (Monthly data sheet, Column G)</p>					
Information Verified by Lead Assessor:					
<p>The method and all parameters that used to monitor for flare operation has been justified in the revised monitoring report version 4 and revised spreadsheet Rev.4. And all information is accordingly with in monitoring plan of registered PDD, so this issue is closed.</p>					
Reasoning for not Acceptance or Acceptance and Close Out:				Date: 05/04/2010	
<p>CL 15 is closed due to all information of tool and parameter about calculated flare has been justified in the revised monitoring report and spreadsheet version 4.</p>					
Acceptance and Close out by Lead Assessor:				Date: 05/04/2010	

Date:	07/03/2011		Raised by:	Assessment Team	
Type:	CAR	Number:	16	Reference:	EB48 Annex66 & 67
Lead Assessor Comment:					
<p>Regarding to the observation during site visit, the installed capacity of LFG electricity generator is inconsistent with information contain in the registered PDD. The 1.1 MW LFG engine has been installed in the project activity but the PDD mentioned clearly that the 1 MW LG engine will be installed. Hence it is the change from the project activity as describes in the registered PDD. (Reference to EB48 Annex66 & 67)</p> <p>The following points are to be substantiated and clarified:</p> <ol style="list-style-type: none"> Are the changes permanent from the registered project activity under one of the following situations? (para7 of EB48 Annex66) <ol style="list-style-type: none"> the project has never been implemented in accordance with description in the registered PDD; or The permanent changes occur after the project activity has been implemented in accordance with the description in the PDD and issuance of CERs has taken place. Please provide the documentary evidences when these changes occurred (para10b of EB48 Annex66) Please provide the documentary evidences towards the reasons for these changes occurred (para10b of EB48 Annex66) Please explain, with documentary evidences, if these changes were known to PP prior to the registration of the project activity. (para10b of EB48 Annex66) 					
Project Participant Response:				Date: 09/03/2011	
<ol style="list-style-type: none"> Project owner has decided to install 1.1MW generator and the Project has never been implemented in accordance with description in the registered PDD as per option (a) of para 7 of EB48 Annex 66. The change of installed capacity of generator occurred when the Jaroensompong's management decided to purchase LFG generator based on quotation from Metro Machinery Co., Ltd. on October 9, 2005. The documentary evidence to demonstrate when the change occurred is attached. There are 3 main reasons that JS selected this particular supplier as below: <ul style="list-style-type: none"> It was not realised that 1 MW capacity of generator stated in the registered PDD meant to be an installed capacity. JS comprehended that 1 MW capacity was the net electricity output that the generator's supplier guaranteed. Considering reliability of the selected supplier, Metro-Caterpillar Thailand, compared to other gas engine suppliers, has been in the machinery business for long time. JS considered that Metro's spare parts and services would be reliable. After visiting the manufacturers of many LFG generators, such as Metro-Caterpillar, Jenbacher, Deutch, Waukesha and Perkins, Jaroensompong's management decided to purchase generator from Metro-Caterpillar. As aforementioned above, it was not realised by PP that 1MW capacity mentioned in the registered PDD is inconsistent with 1.1MW of actual installed capacity prior to the registration of the project activity. 					
Documentation Provided by Project Participant:					
Metro2548.pdf					
Information Verified by Lead Assessor:					

<p>1. Confirmation from PP has been checked with Nameplate of the gas generator set and the quotation which found that gas generator set has been installed since year 2005. Hence project has never been implemented in accordance with information of registered PDD.</p> <p>2. Quotation of the biogas generator set on 09/10/2005 is checked and found that this change has been occurred before the registration of project activity (14/03/2008).</p> <p>3. As per the power purchase agreement between JS and MEA with 1 MW electricity exporting and the specification of the gas generator set (gross at 1.1 MW and net 1 MW). Found that the limitation of net electricity to be generated by project activity is 1 MW. However information in PDD mentioned that 1 MW of gas generator to be installed hence this is the deviation in the information in registered PDD.</p> <p>4. with the clarification from PP, the change was known to PP prior to the registration of project activity but PP not realise that this is change to project implementation against information in PDD.</p>	
Reasoning for not Acceptance or Acceptance and Close Out:	Date: 11/03/2011
Clarification and supporting documents provided from PP are checked and found satisfactory. Hence CAR#16 is closed.	
Acceptance and Close out by Lead Assessor:	Date: 11/03/2011

Date:	26/12/2011	Raised by:	Assessment Team		
Type:	CAR	Number:	17	Reference:	UN Incomplete
Lead Assessor Comment:					
<p>As an increase of 0.1 MW in the installed capacity of the electricity generator, will be resulted as the change in emission reduction of project activity.</p> <p>Please justify and substantiate with documentary evidence on the change to emission reduction of project activity specifically to the below point. In addition, kindly provide the revised PDD, CERs spreadsheet (if applicable).</p> <ol style="list-style-type: none"> 1. Why the gross electricity estimated from the 1 MW in the registered PDD is 8,000 MWh? Is it still valid once change to 1.1 MW? 2. Please provide the supporting documents for new input values of new gen-set at 1.1 MW , in case it is the same figure to registered PDD please provide justification. <ol style="list-style-type: none"> 2.1 The gross electricity generation 2.2 Auxiliary consumption of electricity consume in the project separate in both project activity and generator itself 2.3 The net electricity generated from the project activity (this should be equal to the differential of Gross and Aux consumption) 2.4 Power generation efficiency and the estimation of CH4 energy content. 2.5 Operating hour/days for the gen-set 					
Project Participant Response:				Date: 15/03/2012	
<ol style="list-style-type: none"> 1. The gross electricity for 1.1MW capacity is changed to 8,800 MWh which is derived from 1.1MW x 8,000 hr/yr (i.e.operating hours). <ol style="list-style-type: none"> 2.1 As aforementioned above, the gross electricity is 8,800 MWh. 2.2 Please find an attached file of a confirmation letter about auxiliary consumption from JS, which it demonstrates auxiliary consumption of electricity for the project activity is 109.9kW or 879.2MWh (0.1099MW x8,000 hr/yr). 2.3 Net electricity generation would be 8,800MWh - 879.2MWh = 7,920.8 MWh. 2.4 As per generator specification, power generation efficiency is revised to 36.65%. It is confirmed by the supplier that power generation efficiency can be derived from 1100 KW of engine power / 3001KW of LHV input. <p>Estimation of CH4 energy content of 0.037 GJ/m3 CH4 is a conversion factor from energy input (GJ) to equivalent tons of methane. It is sourced from the Revised 1996 IPCC Guideline for National Greenhouse Gas Inventory; the caloric value of methane is 0.037GJ/m3 (This also explained in the registered PDD, page39).</p> <ol style="list-style-type: none"> 2.5 Operating hour/day is 24 hr for approximately 8,000 hr/yr. Please refer to an attached file of operation and maintenance manual provided by the supplier. 					
Documentation Provided by Project Participant:					
cat spec.pdf Confirmation about auxiliary consumption-JS.pdf Operation and maintenance manual-JS.pdf PDD Rachathewa_03022012.doc (version03.3) Calculation spreadsheet Rachathewa-Rev01 2012.xls Email communication from the technology supplier on the auxiliary fuel require for gen-set. Revised PDD and ER calculation sheet.					
Information Verified by Lead Assessor:					

<p>1. Electricity to be generated from project activity is affected from the change of install capacity. The gross electricity generation of LFG gen-set installed in the project activity is 1.100 MW at full load and 0.8 p.f. (power factor). This is checked against the technical specification and interview of Khun Singthong (i.e. engineer from technology provider). Also the operating hour multiply with rated KW is 8,000 hours/yr consistent to figure mentioned in the operation and maintenance manual. Hence the estimation of gross electricity to be generated in the project activity found reasonable and acceptable.</p> <p>2.1 This point is cleared as explain in point 1.</p> <p>2.2 The figure of auxiliary electricity to be consumed in the project activity are adopted from the declaration from the technology provided and information of project activity by project proponent. Evidence on both figure have been checked and found consistent.</p> <p>2.3 The net electricity to be generated from the project activity is calculated from the different of gross electricity and auxiliary fuel to be consumed. This is reasonable hence no issue.</p> <p>2.4. The power generation efficiency have been calculated from the gross electricity to be generated and input energy at the full load. These figure are checked and consistent to the technical specification from manufacturer of gen-set. About the energy content of CH₄, this is checked in the registered PDD with the formulae used. This is found consistent and acceptable hence no issue.</p> <p>2.5 The operating hour in the gen-set is adopted from the estimated operating hour as per operation and maintenance manual. This is checked that 8,000 hrs/year is mentioned hence no issue.</p>	
Reasoning for not Acceptance or Acceptance and Close Out:	Date: 18/04/2012
Clarification and supporting documents provided from PP are checked and found satisfactory. Hence CAR#17 is closed.	
Acceptance and Close out by Lead Assessor:	Date: 18/04/2012

Date:	26/06/2012	Raised by:	Assessment Team		
Type:	CAR	Number:	18	Reference:	VVS
Lead Assessor Comment:					
<p><u>VVS application</u></p> <p>Reference to the requirement of VVS and its application period (Ref : EB65 Annex6). The project with the post registration change is now effective with VVS track project which have project description change from the registered PDD.</p> <p>In this regard, please provide justification of the VVS application to this project activity. Also the revise project document as appropriate.</p>					
Project Participant Response:				Date: 11/10/2012	
<p>The revised MR follow the VVS requirement is provided. In addition, as per the appendix 1 of PS this project need not to separate submit the post registration change for approval as increasing capacity of LFG electricity generator from 1.0 MW to 1.1 MW is not affect to the baseline applicability, additionality and scale of project activity.</p>					
Documentation Provided by Project Participant:					
Revised MR with the VVS track					
Information Verified by Lead Assessor:					
<p>The revised monitoring report(MR) following the latest format of MR for VVS track has been provided. The format and information has been checked and found correct.</p> <p>As per the appendix 1 of PS, in case the post registration change (i.e. change in project design from registered PDD) which has no effect to the additionality, applicability and scale can submit the information of change as part of the main verification (in one submission) as per para 203-222 of PS (http://cdm.unfccc.int/Reference/Standards/pp/pp_stan01.pdf).</p>					
Reasoning for not Acceptance or Acceptance and Close Out:				Date: 12/10/2012	
<p>As the revised MR following the VVS track has been provided (included information of post registration change).</p> <p>This found satisfactorily hence CAR#18 is closed.</p>					
Acceptance and Close out by Lead Assessor:				Date: 12/10/2012	

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10. Statement of Competence

Statement of Competence

Name: Pitipoom
Tungsirisuteekul

Status

- Lead Assessor	<input checked="" type="checkbox"/>	- Expert	<input type="checkbox"/>
- Assessor	<input checked="" type="checkbox"/>	- Financial Expert	<input type="checkbox"/>
- Local Assessor	<input checked="" type="checkbox"/>	- Technical Reviewer	<input type="checkbox"/>

Scopes of Expertise

1. Energy Industries (renewable / non-renewable)	<input type="checkbox"/>
Technical Area(s):	
2. Energy Distribution	<input type="checkbox"/>
Technical Area(s):	
3. Energy Demand	<input type="checkbox"/>
Technical Area(s):	
4. Manufacturing	<input type="checkbox"/>
Technical Area(s):	
5. Chemical Industry	<input type="checkbox"/>
Technical Area(s):	
6. Construction	<input type="checkbox"/>
Technical Area(s):	
7. Transport	<input type="checkbox"/>
Technical Area(s):	
8. Mining/Mineral Production	<input type="checkbox"/>
Technical Area(s):	
9. Metal Production	<input type="checkbox"/>
Technical Area(s):	
10. Fugitive Emissions from Fuels (solid, oil and gas)	<input type="checkbox"/>
Technical Area(s):	
11. Fugitive Emissions from Production and Consumption of Halocarbons and Sulphur Hexafluoride	<input type="checkbox"/>
Technical Area(s):	
12. Solvent Use	<input type="checkbox"/>
Technical Area(s):	
13. Waste Handling and Disposal	<input type="checkbox"/>
Technical Area(s):	
14. Afforestation and Reforestation	<input type="checkbox"/>
Technical Area(s):	
15. Agriculture	<input type="checkbox"/>
Technical Area(s):	

Approved Member of Staff by: Siddharth Yadav Date: 20/02/2012

Statement of Competence

Name: Nattarin
Thunsiri

Status

- Lead Assessor	x	- Expert	
- Assessor	x	- Financial Expert	
- Local Assessor	Thailand	- Technical Reviewer	

Scopes of Expertise

1. Energy Industries (renewable / non-renewable)	
Technical Area(s):	
2. Energy Distribution	
Technical Area(s):	
3. Energy Demand	
Technical Area(s):	
4. Manufacturing	
Technical Area(s):	
5. Chemical Industry	
Technical Area(s):	
6. Construction	
Technical Area(s):	
7. Transport	
Technical Area(s):	
8. Mining/Mineral Production	
Technical Area(s):	
9. Metal Production	
Technical Area(s):	
10. Fugitive Emissions from Fuels (solid, oil and gas)	
Technical Area(s):	
11. Fugitive Emissions from Production and Consumption of Halocarbons and Sulphur Hexafluoride	
Technical Area(s):	
12. Solvent Use	
Technical Area(s):	
13. Waste Handling and Disposal	
Technical Area(s):	
14. Afforestation and Reforestation	
Technical Area(s):	
15. Agriculture	
Technical Area(s):	

Approved Member of Staff by: Siddharth Yadav Date: 29/02/2012

Statement of Competence

Name: Kasamol
Sansanakul

Status

- Lead Assessor	<input type="checkbox"/>	- Expert	<input type="checkbox"/>
- Assessor	<input type="checkbox"/>	- Financial Expert	<input type="checkbox"/>
- Local Assessor	<input checked="" type="checkbox"/>	- Technical Reviewer	<input type="checkbox"/>

Scopes of Expertise

1. Energy Industries (renewable / non-renewable)	<input type="checkbox"/>
Technical Area(s):	
2. Energy Distribution	<input type="checkbox"/>
Technical Area(s):	
3. Energy Demand	<input type="checkbox"/>
Technical Area(s):	
4. Manufacturing	<input type="checkbox"/>
Technical Area(s):	
5. Chemical Industry	<input type="checkbox"/>
Technical Area(s):	
6. Construction	<input type="checkbox"/>
Technical Area(s):	
7. Transport	<input type="checkbox"/>
Technical Area(s):	
8. Mining/Mineral Production	<input type="checkbox"/>
Technical Area(s):	
9. Metal Production	<input type="checkbox"/>
Technical Area(s):	
10. Fugitive Emissions from Fuels (solid, oil and gas)	<input type="checkbox"/>
Technical Area(s):	
11. Fugitive Emissions from Production and Consumption of Halocarbons and Sulphur Hexafluoride	<input type="checkbox"/>
Technical Area(s):	
12. Solvent Use	<input type="checkbox"/>
Technical Area(s):	
13. Waste Handling and Disposal	<input type="checkbox"/>
Technical Area(s):	
14. Afforestation and Reforestation	<input type="checkbox"/>
Technical Area(s):	
15. Agriculture	<input type="checkbox"/>
Technical Area(s):	

Approved Member of Staff by: Siddharth Yadav Date: 12/03/2012

Statement of Competence

Name: A.T.
Surendra

Status

- Lead Assessor		- Expert	x
- Assessor	x	- Financial Expert	
- Local Assessor	x	- Technical Reviewer	

Scopes of Expertise

1. Energy Industries (renewable / non-renewable)	
Technical Area(s):	
2. Energy Distribution	
Technical Area(s):	
3. Energy Demand	
Technical Area(s):	
4. Manufacturing	
Technical Area(s):	
5. Chemical Industry	
Technical Area(s):	
6. Construction	
Technical Area(s):	
7. Transport	
Technical Area(s):	
8. Mining/Mineral Production	
Technical Area(s):	
9. Metal Production	
Technical Area(s):	
10. Fugitive Emissions from Fuels (solid, oil and gas)	
Technical Area(s):	
11. Fugitive Emissions from Production and Consumption of Halocarbons and Sulphur Hexafluoride	
Technical Area(s):	
12. Solvent Use	
Technical Area(s):	
13. Waste Handling and Disposal	x
Technical Area(s): <i>TA 13.1: Waste handling and disposal</i>	
14. Afforestation and Reforestation	
Technical Area(s):	
15. Agriculture	
Technical Area(s):	

Approved Member of Staff by: Siddharth Yadav Date: 27/03/2012

Statement of Competence

Name: **Joe Sun**

Status

- Lead Assessor	<input type="checkbox"/>	- Expert	<input type="checkbox"/>
- Assessor	<input type="checkbox"/>	- Financial Expert	<input type="checkbox"/>
- Local Assessor	<input type="checkbox"/>	- Technical Reviewer	<input checked="" type="checkbox"/>

Scopes of Expertise

1. Energy Industries (renewable / non-renewable)	<input type="checkbox"/>
Technical Area(s):	
2. Energy Distribution	<input type="checkbox"/>
Technical Area(s):	
3. Energy Demand	<input type="checkbox"/>
Technical Area(s):	
4. Manufacturing	<input type="checkbox"/>
Technical Area(s):	
5. Chemical Industry	<input type="checkbox"/>
Technical Area(s):	
6. Construction	<input type="checkbox"/>
Technical Area(s):	
7. Transport	<input type="checkbox"/>
Technical Area(s):	
8. Mining/Mineral Production	<input type="checkbox"/>
Technical Area(s):	
9. Metal Production	<input type="checkbox"/>
Technical Area(s):	
10. Fugitive Emissions from Fuels (solid, oil and gas)	<input type="checkbox"/>
Technical Area(s):	
11. Fugitive Emissions from Production and Consumption of Halocarbons and Sulphur Hexafluoride	<input type="checkbox"/>
Technical Area(s):	
12. Solvent Use	<input type="checkbox"/>
Technical Area(s):	
13. Waste Handling and Disposal	<input type="checkbox"/>
Technical Area(s):	
14. Afforestation and Reforestation	<input type="checkbox"/>
Technical Area(s):	
15. Agriculture	<input type="checkbox"/>
Technical Area(s):	

Approved Member of Staff by: **Siddharth Yadav** Date: **11/09/2012**

Statement of Competence

Name: Shute Li

Status

- Lead Assessor	x	- Expert	x
- Assessor	x	- Financial Expert	
- Local Assessor	China	- Technical Reviewer	x

Scopes of Expertise

1. Energy Industries (renewable / non-renewable)	x
Technical Area(s): TA 1.2 Energy generation from renewable energy sources	
2. Energy Distribution	
Technical Area(s):	
3. Energy Demand	
Technical Area(s):	
4. Manufacturing	
Technical Area(s):	
5. Chemical Industry	
Technical Area(s):	
6. Construction	
Technical Area(s):	
7. Transport	
Technical Area(s):	
8. Mining/Mineral Production	
Technical Area(s):	
9. Metal Production	
Technical Area(s):	
10. Fugitive Emissions from Fuels (solid, oil and gas)	
Technical Area(s):	
11. Fugitive Emissions from Production and Consumption of Halocarbons and Sulphur Hexafluoride	x
Technical Area(s): TA 11.2 GHG capture and destruction	
12. Solvent Use	
Technical Area(s):	
13. Waste Handling and Disposal	x
Technical Area(s): TA 13.1: Waste handling and disposal	
14. Afforestation and Reforestation	
Technical Area(s):	
15. Agriculture	
Technical Area(s):	

Approved Member of Staff by: Siddharth Yadav Date: 01/08/2012

11. Photographic Evidence

Unique reference number: N1T1109491336

Parameter: $LFG_{\text{flare},y}$ (Amount of landfill gas flared)

Name of equipment: FL-01

Date: 01/07/2009



Unique reference number: N1U0139599904

Parameter: $LFG_{\text{total},y}$ (Total amount of landfill gas captured)

Name of equipment: FL-02

Date: 01/07/2009



Unique reference number: N1U0139599905

Name of equipment: FL-03

Parameter: $LFG_{\text{electricity},y}$ (Amount of landfill gas combusted in power plant)

Date: 01/07/2009



Unique reference number: I-02253

Name of equipment: GA02

Parameter: $w_{CH_4,y}$ (Methane fraction in the landfill gas)

Date: 01/07/2009



Unique reference number: 945011V

Name of equipment: N/A (Flame detector)

Parameter: Flare operation parameter

Date: 01/07/2009



Unique reference number: T07216/PT07081

Name of equipment: TE-01

Parameter: T (Temperature of landfill gas)

Date: 01/07/2009



Unique reference number: T08003/PT08015

Name of equipment: TE-02

Parameter: T (Temperature of landfill gas)

Date: No picture available as this device is out of order after this monitoring period.

Unique reference number: T08151/PT08133

Name of equipment: TE-03

Parameter: T (Temperature of landfill gas)

Date: 01/07/2009



Unique reference number: 1107030328

Name of equipment: PR-01

Parameter: P (Pressure of the landfill gas)

Date: 01/07/2009



Unique reference number: 1107030324

Name of equipment: PR-02

Parameter: P (Pressure of the landfill gas)

Date: No picture available as this device is out of order after this monitoring period.

Unique reference number: 0702080001

Name of equipment: PR-03

Parameter: P (Pressure of the landfill gas)

Date: 01/07/2009



Unique reference number: PK-201103

Name of equipment: N/A (This is MEA's meter)

Parameter: $EL_{EX,LPG}$ (Total amount of electricity exported out of the project boundary) and EL_{IMP} (Total amount of electricity imported to meet project requirement)

Date: 01/07/2009



Unique reference number: N/A

Parameter: Operation of the energy plant

Name of equipment: Analogue gauge at Date: 01/07/2009
Generator set



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History

Version	EB Requirement	Nature of revision	Validity
Issue 6	VVs Version 02.0	Update to checklist to include VVS procedures	25 th May 2012
Issue 5.4	VVM Version 01.2	Update to checklist	24 th February 2011