



Industrie Service

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# Verification Report

Verification of the Registered CDM Project

“Switching of fuel from Low Sulphur Waxy Residue fuel oil to  
natural gas at Gangnam branch Korea District Heating  
Corporation Project”

UNFCCC reference number: 0835

Monitoring period #1: 01/04/2008 to 31/03/2009

Report No. 600500281

**18/06/2012**

TÜV SÜD Industrie Service GmbH  
Carbon Management Service  
Westendstrasse 199 - 80686 Munich - GERMANY

Date of first issue of this report	15/09/2011
Revision No. of this report	6
Registered PDD (version/date)	Version 1.03 – 18/02/2011
Registration date	02/04/2007
Revised Monitoring Plan	N.A.
Methodology (number / version)	ACM0009, Version 03
Start date of crediting period	01-04-2008
Published Monitoring Report (version/date)	Version 1 – 14/05/2009
Final Monitoring Report (version/date)	Version 7 – 18/06/2012
Scope	1 & 4
Technical Area	1.1 & 4.10
Location of the Project	Republic of Korea / 732 Suseo-Dong, Gangnam-Gu, Seoul GPS: Latitude 37.490006°/ Longitude 127.094667°
Project Participant (contractor)	Korea District Heating Corporation
Project Documentation Link	<a href="http://cdm.unfccc.int/Projects/DB/DNV-CUK1167217026.24/view">http://cdm.unfccc.int/Projects/DB/DNV-CUK1167217026.24/view</a>

### VERIFICATION CONCLUSION

TÜV SÜD Industrie Service GmbH has performed the periodic verification of the aforementioned CDM project activity. The verification is based on the currently valid documentation of the United Nations Framework Convention on Climate Change (UNFCCC).

The management of Korea District Heating Corporation is responsible for the preparation of the GHG emissions data and the reported GHG emission reductions on the basis set out within the project's Monitoring Plan indicated in the registered PDD and the applied methodology with the Notification of PDD change accepted by CDM EB dated 20/05/2011.

The verifier can confirm that:

- the development and maintenance of records and reporting procedures are in accordance with the registered monitoring plan;
- the project is operated as planned and described in the project design document approved by the EB;
- the installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately;
- the monitoring system is in place and generates GHG emission reductions data;
- the GHG emission reductions are calculated without material misstatements;
- the monitoring plan in Monitoring Report is as per the PDD and monitoring plan approved by the EB;
- the monitoring plan in the approved PDD is as per the applied methodology;
- There is an audit trail that contains the evidence and records that validate the stated figures.

Based on the information we have seen and evaluated, we confirm that the project activity achieved the verified amount of reductions in anthropogenic emissions by sources of



greenhouse gases that would not have occurred in the absence of the project activity.

Verified emission reductions in this monitoring period: 44 574 t CO<sub>2e</sub>

Munich, 18/06/2012

A handwritten signature in blue ink, appearing to read 'Thomas Kiese'.

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Certification Body "climate and energy"  
TÜV SÜD Industrie Service GmbH

Munich, 18/06/2012

A handwritten signature in blue ink, consisting of several stylized, overlapping strokes.

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Assessment Team Leader



## Abbreviations

<b>ACM</b>	Approved Consolidated Methodology
<b>BM</b>	Build Margin
<b>CAR</b>	Corrective Action Request
<b>CDM</b>	Clean Development Mechanism
<b>CDM-EB</b>	CDM Executive Board
<b>CER</b>	Certified Emission Reduction
<b>CM</b>	Combined Margin
<b>CMP</b>	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
<b>CO<sub>2e</sub></b>	Carbon dioxide equivalent
<b>CR / CL</b>	Clarification Request
<b>DNA</b>	Designated National Authority
<b>DOE</b>	Designated Operational Entity
<b>EF</b>	Emission Factor
<b>EIA / EA</b>	Environmental Impact Assessment / Environmental Assessment
<b>ER</b>	Emission Reduction
<b>FAR</b>	Forward Action Request
<b>FSR</b>	Feasibility Study Report
<b>GHG</b>	Greenhouse Gas(es)
<b>GWP</b>	Global Warming Potential
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>IRL</b>	Information Reference List
<b>KP</b>	Kyoto Protocol
<b>MP</b>	Monitoring Plan
<b>MR</b>	Monitoring Report
<b>OM</b>	Operational Margin
<b>PCP</b>	Project Cycle Procedure
<b>PDD</b>	Project Design Document
<b>PP</b>	Project Participant
<b>PS</b>	Project Standard
<b>TÜV SÜD</b>	TÜV SÜD Industrie Service GmbH
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>VVS</b>	Clean Development Mechanism Validation And Verification Standard



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Annex 1: List of Findings

Annex 2: Information Reference List

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## 1 METHODOLOGY

### 1.1 Objective

TÜV SÜD has been commissioned by the aforementioned client to perform an independent verification assessment.

The objective of the verification work is to comply with the requirements of paragraph 62 of the CDM Modalities and Procedures. According to this assessment TÜV SÜD shall:

- ensure that the project activity has been implemented and operated as per the registered PDD and that all physical features (technology, project equipment, monitoring and metering equipment) of the project are in place,
- ensure that the published MR and other supporting documents provided are complete, verifiable and in accordance with applicable CDM requirements,
- ensure that the actual monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan and the approved methodology,
- evaluate the data recorded and stored as per the applicable requirements.

### 1.2 Scope

The verification scope encompasses an independent and objective review and ex-post determination of the monitored reductions in GHG emissions by the Designated Operational Entity. The verification is based on the submitted monitoring report, the validated project design documents including its monitoring plan and validation report, previous verification reports (if any), the applied monitoring methodology, relevant decisions, clarifications and guidance from the CMP and the EB and any other information and references relevant to the project activity's resulting emission reductions. These documents are reviewed against the requirements of the Kyoto Protocol, the CDM Modalities and Procedures and related rules and guidance.

Based on the requirements in the VVS, TÜV SÜD has applied a rule-based approach for the verification of the project. The principles of accuracy, completeness, relevance, reliability and credibility were combined with a conservative approach to establish a traceable and transparent verification opinion.

The verification considers both quantitative and qualitative information on emission reductions.

The verification is not meant to provide any consultancy towards the client. However, stated requests for clarifications, corrective and/or forward actions may provide input for improvement of the monitoring activities.

### 1.3 Verification Process

The information provided by the project participants is assessed by applying the means of verification specified in the VVS and where appropriate standard auditing techniques like specified paragraph 217 of VVS. In the absence of specific means of verification specified in the VVS the standard auditing techniques are applied.

Once TÜV SÜD receives the Monitoring Report and a confirmation from any PP to upload, the MR is made publicly available through a dedicated interface on the UNFCCC CDM website.

Before the assessment begins a competent team to perform the verification is selected. The team is selected to cover the technical area(s), sectoral scope(s) and relevant host country experience for evaluating the CDM project activity. Additionally a competent Technical



Reviewer or Technical Reviewer Team is appointed to conduct checks on quality and completeness.

The verification team performs first a desk review, followed by an on-site visit, which results in the formation of a draft report and a list of findings. The next step involves the evaluation of the findings through direct communication with the PPs and then finally the preparation of the verification report. This verification report and other supporting documents then undergo an internal quality control by the CB “climate and energy” before submission to the CDM-EB.

## 1.4 Appointment of the Team

According to the technical scopes and experiences in the sectoral or national business environment, TÜV SÜD has composed a project team in accordance with the appointment rules of the TÜV SÜD certification body “climate and energy”.

The composition of an assessment team has to be approved by the Certification Body (CB) to assure that the required skills are covered by the team. The CB TÜV SÜD operates the following qualification levels for team members that are assigned by formal appointment rules:

- Assessment Team Leader (ATL);
- Verifier (V);
- Verifier Trainee (T);
- Technical Experts (TE);
- Country expert (CE);
- Technical review (TR).

It is required that the sectoral scope(s) and the technical area(s) (TA) linked to the methodology/ies and project have to be covered by the assessment team. Appointment certificates of the selected team members are attached to this report as Annex.

### Assessment Team:

Name	Qualification	Scope	Technical Area	Host country experience	Onsite visit
Robert Köhn	ATL	<input checked="" type="checkbox"/> (1 & 4)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-
Jung-Ho Yoon	V	<input checked="" type="checkbox"/> (1)	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Yoshida Yutaka	V	<input checked="" type="checkbox"/> (1 & 4)	<input checked="" type="checkbox"/> (1.1 & 4.10)	-	-
In-Hwan Kim	Auditor	-	-	-	<input checked="" type="checkbox"/> <sup>†</sup>

### Technical Reviewer (s):

Name	Qualification	Coverage of scope	Coverage of technical area	Coverage of financial aspect
Luciano Grugni	TR	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> (All)	
Martin Hammer	TR	<input checked="" type="checkbox"/>	-	

\* Under the old standard appointed as verifier for CDM project, currently is still not re-appointed

<sup>†</sup> The sectoral scopes 1 & 4 were covered during the on-site mission dated June 8 ~ 9, 2009 by In-Hwan Kim as per the appointments valid at that time. At the time of on-site mission, there was no specific TAs were specified for ACM0009 yet.

## 1.5 Review of Documents

GSP has been initiated before the verification activities started. Based on the published MR the assessment team performed a desk review to:

- verify the completeness of the data and the information presented in the MR,
- check the compliance of the MR with respect to the monitoring plan depicted in the registered PDD and verify that the applied methodology was carried out. Particular attention to the frequency of measurements, the quality of the metering equipment including calibration requirements, and the quality assurance and quality control procedures was paid,
- evaluate the data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

A complete list of all documents reviewed is available in the Information Reference List attached as Annex 2 to this report.

## 1.6 On-site Assessment and follow-up Interviews

During on-site visit TÜV SÜD performed a physical site inspection and interviewed project stakeholders to:

- confirm the implementation and operation of the project,
- review the data flow for generating, aggregating and reporting the monitoring parameters,
- confirm the correct implementation of procedures for operations and data collection,
- cross-check the information provided in the MR documentation with other sources,
- check the monitoring equipment against the requirements of the PDD and the approved methodology, including calibrations, maintenance, etc.,
- review the calculations and assumptions used to obtain the GHG data and ER,
- identify if the quality control and quality assurance procedures are in place to prevent or correct errors or omissions in the reported parameters.

A list of all persons interviewed is included in the IRL attached as Annex 2 to this report.

## 1.7 Resolution of Clarification and Corrective and Forward Action Requests

The objective of this phase of the verification is to resolve the requests for corrective actions, clarifications, and any other outstanding issues which need to be clarified for TÜV SÜD's conclusion on the project design. The CARs and CRs raised by TÜV SÜD are resolved during communication between the client and TÜV SÜD. To guarantee the transparency of the validation process, the concerns raised and responses that have been given are documented in detail in the List of Findings that is attached as Annex 1 to this report.

## 1.8 Internal Quality Control

Internal quality control within the team is assured by means of a technical review process that takes place after the on-site assessment and after closure of findings. The internal quality control in the validation process is given by the final decision (Validation Opinion) made by the CB "climate and energy".

## 2 REPORTING REQUIREMENTS

In the following sections, the results of the verification are stated. The verification results relate to the project performance as documented and described in the final PDD final Monitoring Report. The verification findings for each verification subject are presented below.

### 2.1 FARs from Validation / Previous Verification

No FARs have been presented in the validation report.

### 2.2 Project Implementation in accordance with the registered Project Design Document

The project is fully implemented according to the description presented in the registered PDD. The verifier confirms, through the visual inspection that all physical features of the proposed CDM project activity including data collecting systems and storage have been implemented in accordance with the registered PDD. The project activity is completely operational and the same has been confirmed on-site.

By comparing the actual ER claimed in this monitoring period with the estimate in the registered PDD, the actual result is smaller than what is stated in the PDD. The following data and or variables differ from the PDD and the explanation of this difference is presented here:

- Heat production amount in this monitoring period is less than the historical amount. Less heat production requires less natural gas consumption ( $FF_{\text{project}}$ ) of 3 new HOBs. Therefore, ER amount for this monitoring period is also less than PDD estimates consequently.

#### [Notification of change of the registered PDD according to Annex 66\* & 67†, EB48]

None of the data affects the additionality, scale or applicability of the project, hence no request for approval of PDD change has been submitted to the EB.

However, the notification of PDD change has been sought EB's decision for the correct application of calorific value from Gross to Net and it was accepted on 20 May 2011. The results of PDD change notification can be found in the below link.

- <http://cdm.unfccc.int/Projects/DB/DNV-CUK1167217026.24/view>

#### [Correction of PDD title according to Annex 4‡ & 5§ of EB 65]

During the above notification, the revised PDD with wrong project title was overlooked and finally accepted by EB.

The detail of PDD title is as below.

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\* Annex 66, EB48: Procedures for notifying and requesting approval of changes from the project activity as described in the registered project design document

† Annex 67, EB48: Guidelines on assessment of different types of changes from the project activity as described in the registered PDD

‡ Annex 4, EB65: Clean Development Mechanism Validation and Verification Standard

§ Annex 5, EB65: Clean Development Mechanism Project Standard



- Original PDD title: "Switching of fuel from Low Sulphur Waxy Residue fuel oil to natural gas at Gangnam branch Korea District Heating Corporation Project" version 1.02, dated 08/11/2006
- Wrong PDD title after notification of change: "Switching of fuel from Low Sulphur Waxy Residue fuel oil (LSWR) to natural gas at heat-only boiler in district heating system" version 1.03, dated 18/02/2010

Due to this inconsistency of project title, the correction is seeking the approval of the Board according to 'Appendix 1. Changes that do not require prior approval by the board' of Annex 5, EB65.

The verification team verified the revised PDD corrected the title

- from ["Switching of fuel from Low Sulphur Waxy Residue fuel oil (LSWR) to natural gas at heat-only boiler in district heating system" version 1.03, dated 18/02/2010]
- to ["Switching of fuel from Low Sulphur Waxy Residue fuel oil to natural gas at Gangnam branch Korea District Heating Corporation Project" version 1.04, dated 15/06/2012]

and confirms that the corrected information comply with the requirement of the project standard.

The verification team also confirms that the corrected information is an accurate reflection of actual project information and there is no information corrected related to the applied methodology and/or selected monitoring plan.

The revised PDD with the correct title is attached in Annex 2. IRL # 3-2.

## 2.3 Compliance of the Monitoring Plan with the Monitoring Methodology

The monitoring plan is in accordance with the approved methodology, ACM0009, Version 03, applied by the proposed CDM project activity. Neither a revision nor a deviation to the monitoring plan has been requested to the CDM Executive Board.

## 2.4 Compliance of the Monitoring with the Monitoring Plan

The monitoring has been carried out in accordance with the monitoring plan contained in the registered PDD. All parameters were monitored and determined as per the Monitoring Plan.

The verification of the parameters required by the monitoring plan is provided as follows:

<b>Data / Parameter:</b>	FF <sub>project,i,y</sub>
<b>Data unit:</b>	Nm <sup>3</sup>
<b>Description:</b>	Natural gas consumed in element process <i>i</i> in year <i>y</i>
<b>Source of data used:</b>	DCS data (monitoring records by KDHC)
<b>Means of verification/Comments:</b>	<p>The measured data by 9 flow meters were saved in DCS and the recorded data in DCS have been checked by the audit team.</p> <p>The calibration interval for flow meter, temperature and pressure meter is 2 years defined by "Periodic inspection and maintenance procedure, EMP-28".</p> <p>The calibration certificates of flow meters were valid and the interval of calibration has been closely checked and has been kept.</p>



	<p>The calibrations for each flow meter were performed as below.</p> <table><thead><tr><th></th><th><u>Initial</u></th><th><u>Periodic</u></th></tr></thead><tbody><tr><td>S/N: C15-S0539HN</td><td>/ 2006-06-17</td><td>/ 2008-06-10</td></tr><tr><td>S/N: C15-S0561HN</td><td>/ 2006-06-17</td><td>/ 2008-06-10</td></tr><tr><td>S/N: C15-S0554HN</td><td>/ 2006-06-18</td><td>/ 2008-06-09</td></tr><tr><td>S/N: C15-S0637HN</td><td>/ 2006-06-18</td><td>/ 2008-06-09</td></tr><tr><td>S/N: C15-S0635HN</td><td>/ 2006-06-19</td><td>/ 2008-06-10</td></tr><tr><td>S/N: C15-S0537HN</td><td>/ 2006-06-19</td><td>/ 2008-06-09</td></tr><tr><td>S/N: C15-S0633HN</td><td>/ 2006-06-20</td><td>/ 2008-06-10</td></tr><tr><td>S/N: C15-S0553HN</td><td>/ 2006-08-23</td><td>/ 2008-06-10</td></tr><tr><td>S/N: C15-S0655HN</td><td>/ 2006-08-22</td><td>/ 2008-06-09</td></tr></tbody></table> <p>Temperature and pressure meters for normalizing gas volume were calibrated as below.</p> <table><thead><tr><th></th><th><u>Initial</u></th><th><u>Periodic</u></th></tr></thead><tbody><tr><td>Temperature meter: S/N: B31862343</td><td>/ 2006-06-16</td><td>/ 2008-07-07</td></tr><tr><td>B317603637</td><td>/ 2006-06-16</td><td>/ 2008-07-07</td></tr><tr><td>B322671937</td><td>/ 2006-06-16</td><td>/ 2008-07-07</td></tr><tr><td>Pressure meter : S/N: 06060206001</td><td>/ 2006-06-22</td><td>/ 2008-07-07</td></tr><tr><td>06060206009</td><td>/ 2006-06-22</td><td>/ 2008-07-07</td></tr><tr><td>06060206017</td><td>/ 2006-06-22</td><td>/ 2008-07-07</td></tr></tbody></table> <p>The verification team investigated the invalid calibration periods i.e. 21 days for temperature meter (from 2008-06-16 to 2008-07-06) and 15 days for pressure meter (from 2008-06-22 to 2008-07-06). During the above periods, the facilities were not operated at all. Therefore, there is no impact on the above overdue calibration.</p> <p>For your information, the facilities were not operated during summer season when heat demand is very low.</p>		<u>Initial</u>	<u>Periodic</u>	S/N: C15-S0539HN	/ 2006-06-17	/ 2008-06-10	S/N: C15-S0561HN	/ 2006-06-17	/ 2008-06-10	S/N: C15-S0554HN	/ 2006-06-18	/ 2008-06-09	S/N: C15-S0637HN	/ 2006-06-18	/ 2008-06-09	S/N: C15-S0635HN	/ 2006-06-19	/ 2008-06-10	S/N: C15-S0537HN	/ 2006-06-19	/ 2008-06-09	S/N: C15-S0633HN	/ 2006-06-20	/ 2008-06-10	S/N: C15-S0553HN	/ 2006-08-23	/ 2008-06-10	S/N: C15-S0655HN	/ 2006-08-22	/ 2008-06-09		<u>Initial</u>	<u>Periodic</u>	Temperature meter: S/N: B31862343	/ 2006-06-16	/ 2008-07-07	B317603637	/ 2006-06-16	/ 2008-07-07	B322671937	/ 2006-06-16	/ 2008-07-07	Pressure meter : S/N: 06060206001	/ 2006-06-22	/ 2008-07-07	06060206009	/ 2006-06-22	/ 2008-07-07	06060206017	/ 2006-06-22	/ 2008-07-07
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Cross-check	Presented data has been cross-checked with data in DCS as well as daily log sheets and also checked with LNG invoices from the supplier.																																																			

<b>Data / Parameter:</b>	$\epsilon_{\text{project, i, y}}$
Data unit:	%
Description:	Fuel efficiency of natural gas used at the element process <i>i</i>
Source of data used:	Calculated using DCS data (monitoring records by KDHC)
Means of verification/Comments:	<p>The fuel efficiencies of natural gas have been checked by manual re-calculation with the below formula.</p> <ul style="list-style-type: none"> <li>Fuel efficiency = Heat production / (Fuel consumption x NCV)</li> </ul> <p>The produced heat is automatically calculated using the measured data i.e. water flow and temperature difference before and after HOBs.</p> <p>For 'fuel consumption' and 'heat production', please refer to the above and below parameters, <math>FF_{\text{project, i, y}}</math> &amp; <math>HG_{\text{project, i, y}}</math>.</p> <p>The verification team checked the operation time according to the operation mode i.e. operating &amp; stops. This efficiency was weighed by the time these operation modes. Please refer to IRL # 6 in Annex 2</p>
Cross-check	This is a calculated value by two inputs which are fuel consumption and heat production. Therefore, cross check for this value has been done with manual calculation.

<b>Data / Parameter:</b>	$HG_{\text{project, i, y}}$
Data unit:	Gcal

Description:	Heat produced by the element process <i>i</i> in the year <i>y</i>																														
Source of data used:	DCS data (monitoring records by KDHC)																														
Means of verification/Comments:	<p>The produced heat is automatically calculated using the measured data i.e. water flow and temperature difference before and after HOBs.</p> <p>The valid calibration certificates of 3 water flow meters and 9 temperature sensors have been checked. The calibration interval, 2 years for temperature sensors has not been kept but there was no heat production in June so the calibration certificate is acceptable.</p> <p><b><u>Calibration status</u></b></p> <p>9 Temperature meters and 3 water flow meters were calibrated as below.</p> <table><thead><tr><th></th><th><b><u>Initial</u></b></th><th><b><u>Periodic</u></b></th></tr></thead><tbody><tr><td>Temperature meter: S/N: B322662337</td><td>/ 2006-06-16</td><td>/ 2008-06-24</td></tr><tr><td>B215675137</td><td>/ 2006-06-16</td><td>/ 2008-06-24</td></tr><tr><td>B323684437</td><td>/ 2006-06-16</td><td>/ 2008-06-24</td></tr><tr><td>B322662037</td><td>/ 2006-06-16</td><td>/ 2008-06-24</td></tr><tr><td>B317603437</td><td>/ 2006-06-16</td><td>/ 2008-06-24</td></tr><tr><td>B215679937</td><td>/ 2006-06-16</td><td>/ 2008-06-24</td></tr><tr><td>B215674937</td><td>/ 2006-06-16</td><td>/ 2008-06-24</td></tr><tr><td>B323679337</td><td>/ 2006-06-16</td><td>/ 2008-06-24</td></tr><tr><td>B324699737</td><td>/ 2006-06-16</td><td>/ 2008-06-24</td></tr></tbody></table> <p>Flow meters (water): S/N: A06 68017 / 2006-08-17 / 2008-06-17 A06 68015 / 2006-08-17 / 2008-06-17 A06 68016 / 2006-08-17 / 2008-06-17</p> <p>The calibration interval for the flow meter is 2 years defined by “Periodic inspection and maintenance procedure, EMP-28”.</p>		<b><u>Initial</u></b>	<b><u>Periodic</u></b>	Temperature meter: S/N: B322662337	/ 2006-06-16	/ 2008-06-24	B215675137	/ 2006-06-16	/ 2008-06-24	B323684437	/ 2006-06-16	/ 2008-06-24	B322662037	/ 2006-06-16	/ 2008-06-24	B317603437	/ 2006-06-16	/ 2008-06-24	B215679937	/ 2006-06-16	/ 2008-06-24	B215674937	/ 2006-06-16	/ 2008-06-24	B323679337	/ 2006-06-16	/ 2008-06-24	B324699737	/ 2006-06-16	/ 2008-06-24
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Cross-check	Presented data has been cross-checked with data in DCS as well as daily log sheets.																														

<b>Data / Parameter:</b>	$NCV_{LSWR,y}$
Data unit:	Kcal/l
Description:	Net calorific value of LSWR in year $y$
Source of data used:	Korean national data (The Ministry of Knowledge Economy)
Means of verification/Comments:	<p>National data &amp; Registered PDD: 9,350 kcal/l</p> <p>There was no data availability from LSWR supplier, therefore, the national data was used. The verification team checked the certificate of LSWR from SGS which didnot state the NCV value. (IRL # 49)</p>
Cross-check	-

<b>Data / Parameter:</b>	$NCV_{NG,y}$
Data unit:	Kcal/ Nm <sup>3</sup>
Description:	Net calorific value of natural gas in year $y$
Source of data used:	Korean national data (The Ministry of Knowledge Economy)
Means of verification/Comments:	<p>National data &amp; Registered PDD: 9,550 kcal/ Nm<sup>3</sup></p> <p>There was no data availability from LNG supplier, Daehan City Gas Co., Ltd therefore, the national data was used. The verification team confirmed the non-availability of NCV values supplied by Daehan City Gas Co., Ltd through e-mail communication (IRL # 49)</p>
Cross-check	-

<b>Data / Parameter:</b>	$EF_{LSWR,CO_2,y}$
Data unit:	tCO <sub>2</sub> e / TJ

Description:	CO2 emission factor of LSWR combusted in year y
Source of data used:	IPCC value
Means of verification/Comments:	IPCC guideline and Registered PDD: 77.3667 tCO <sub>2</sub> e / TJ The data of EF <sub>LSWR</sub> was not available from LSWR supplier nor from the host country. Therefore, IPCC default value of LSWR was used.
Cross-check	-

<b>Data / Parameter:</b>	EF <sub>NG,CO2,y</sub>
Data unit:	tCO <sub>2</sub> e / TJ
Description:	CO2 emission factor of NG combusted in year y
Source of data used:	IPCC value
Means of verification/Comments:	IPCC guideline and Registered PDD: 56.1 tCO <sub>2</sub> e / TJ The data of EF <sub>NG</sub> was not available from LNG supplier nor from the host country. Therefore, IPCC default value of LNG was used.
Cross-check	-

## 2.5 Assessment of Data and Calculation of Greenhouse Gas Emission Reductions

All data has been available and all the parameters have been monitored in accordance with the registered monitoring plan.

Due to the wrong application of calorific value, the notification of PDD change has been sought EB's decision and it was finally accepted dated 20 May 2011 and it can be found in the below link.

- <http://cdm.unfccc.int/Projects/DB/DNV-CUK1167217026.24/view>

The reported data have been cross-checked against other sources available as explained above in chapter 3.4.

The verifier confirms that the methods and formulae used to obtain the baseline, project and leakage emissions are appropriate. The same has been done in accordance with the methods and formulae described in the registered monitoring plan and applicable methodology.

The verifier confirms that the monitoring report includes all parameters and the monitored data at the intervals required by the methodology and PDD.

The verifier confirms that all emission factors and default values (ex-ante values from PDD) have been correctly justified. All the emission factors and default values are explicitly mentioned in the monitoring report.



## **Annex 1**

### **List of Findings**

# List of Findings - Compilation and Resolutions

Version: 06 - Final

Project Title: "Switching of fuel from Low Sulphur Waxy Residue fuel oil to natural gas at Gangnam branch Korea District Heating Corporation Project"

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Definitions	
<b>Shall / Should / May</b>	In addition to the definitions contained in the Glossary of CDM terms, the following terms apply in the VVS (VVS/10): <u>Shall</u> is used to indicate requirements to be followed; <u>Should</u> is used to indicate that among several possibilities, one course of action is recommended as particularly suitable; <u>May</u> is used to indicate what is permitted.
<b>Credible</b>	Information is credible if it is authentic and is able to inspire belief or trust, and the willingness of persons to accept the quality of evidence. (VVS/17)
<b>Reliable</b>	Information is reliable if the quality of evidence is accurate and credible and able to yield the same results on a repeated basis. (VVS/17)
<b>CAR</b>	The DOE shall raise a CAR if one of the following situations occur: (VVS/220) (a) 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; (b) Modifications to the implementation, operation and monitoring of the registered project activity has not been sufficiently documented by the project participants; (c) Mistakes have been made in applying assumptions, data or calculations of emission reductions that will impact the quantity of emission reductions; (d) Issues identified in a FAR during validation to be verified during verification or previous verification(s) have not been resolved by the project participants.
<b>CL</b>	The DOE shall raise a CL if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met. (VVS/221)
<b>FAR</b>	The DOE shall raise a FAR during verification for actions if the monitoring and reporting require attention and/or adjustment for the next verification period. (VVS/223)

## Compilation and Resolutions of CARs, CRs and FARs

Corrective Action Requests by validation team		
	Comments and Results	Conclusion and IRL
Issue	Conservative approach to the calculation of Emission reduction in verification activity	<input checked="" type="checkbox"/> Finding Closed IRL # 4.
Requirement	According to the paragraph '17(d) Asses the accuracy, conservativeness, relevance, completeness, consistency and transparency of the information provided by project participants' of Annex 5. Validation and Verification Standard, EB65	
Corrective Action Request	<b><u>Corrective Action Request No.1</u></b> The formula of ER spreadsheet correctly applied to data but the round function does not applied. PP is requested to apply the round function and submit the revised ER spreadsheet to	

## List of Findings - Compilation and Resolutions

Version: 06 - Final

Project Title: "Switching of fuel from Low Sulphur Waxy Residue fuel oil to natural gas at Gangnam branch Korea District Heating Corporation Project"

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Corrective Action Requests by validation team		
	the audit team.	
Response	The round function were applied to ER spreadsheet and the revised ER spreadsheet were provided to DOE	
Assessment Means of verification	The revised ER spreadsheet were correctly applied the round function. As the results of this, the ER amount was decreased from 45 323 tCO <sub>2</sub> e to 44 574 tCO <sub>2</sub> e.	
Adjustment on project design OR Changes in the monitoring report or supporting annexes	No changes on MR neither PDD. The supporting document, the ER calculation file is attached in Annex 2. IRL # 4.	

Corrective Action Requests by validation team		
	Comments and Results	Conclusion and IRL
Issue	The application of calorific value shall be not 'Gross' but 'Net'. The registered PDD ver. 1.03 contained the wrong gross calorific value for the overall calculation.	<input checked="" type="checkbox"/> Finding Closed IRL # 3-1.
Requirement	The net calorific value shall be applied to the calculation of Baseline Emission, Project Emission and Emission Reduction not the gross calorific value according to the applied methodology, ACM0009 version 3.	
Corrective Action Request	<b><u>Corrective Action Request No.2</u></b> The wrong calorific value was applied in the calculation of the baseline energy efficiencies in the registered PDD. PP is requested to revise PDD applying the correct net calorific value instead of the gross calorific value.	

## List of Findings - Compilation and Resolutions

Version: 06 - Final

Project Title: "Switching of fuel from Low Sulphur Waxy Residue fuel oil to natural gas at Gangnam branch Korea District Heating Corporation Project"

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Corrective Action Requests by validation team		
Response	PP revised and submitted PDD with correct application of net calorific value together with supporting documents.	
Assessment Means of verification	The submitted documents were reviewed and validated for the notification of PDD change. The notification has been sought EB's decision and it was accepted by EB on 20 May 2011.	
Adjustment on project design OR Changes in the monitoring report or supporting annexes	The revised PDD version 1.03, 18/02/2011 was attached in Annex 2, IRL # 3-1.	

Corrective Action Requests by validation team		
	Comments and Results	Conclusion and IRL
Issue	The PDD title after the notification process was changed unintentionally.	<input checked="" type="checkbox"/> Finding Closed IRL # 3-2.
Requirement	PDD title shall be consistent to all documentation. Therefore, PDD with wrong title shall be corrected according to 'Annex 4. Clean Development Mechanism Validation and Verification Standard' & 'Annex 5. Clean Development Mechanism Project Standard', EB65	
Corrective Action Request	<b><u>Corrective Action Request No.3</u></b> The revised PDD through the notification of change contains the wrong title. Therefore, PP is requested to correct the title from "Switching of fuel from Low Sulphur Waxy Residue fuel oil (LSWR) to natural gas at heat-only boiler in district heating system" to "Switching of fuel from Low Sulphur Waxy Residue fuel oil to natural gas at Gangnam branch Korea District Heating Corporation Project"	
Response	PP corrected the title of PDD with the original project name and the revised PDD was submitted to DOE.	

## List of Findings - Compilation and Resolutions

Version: 06 - Final

Project Title: "Switching of fuel from Low Sulphur Waxy Residue fuel oil to natural gas at Gangnam branch Korea District Heating Corporation Project"

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Corrective Action Requests by validation team		
Assessment Means of verification	<p>The verification team checked the title of revised PDD and it is correctly stated in the revised PDD. The title, version &amp; date of the revised PDD were as below.</p> <ul style="list-style-type: none"> <li>- Title: Switching of fuel from Low Sulphur Waxy Residue fuel oil to natural gas at Gangnam branch Korea District Heating Corporation Project"</li> <li>- Version: 1.04,</li> <li>- Date: 15/06/2012</li> </ul> <p>The verification team confirms that the above is correct and accurate.</p>	
Adjustment on project design OR Changes in the monitoring report or supporting annexes	The revised PDD version 1.04, 15/06/2012 was attached in Annex 2, IRL # 3-2.	

Clarification Requests by validation team		
	Comments and Results	Conclusion and IRL
Issue	The location of project site should be stated with GPS coordinates.	<input checked="" type="checkbox"/> Finding Closed IRL # 2.
Requirement	Project site should be stated with decimal type of GPS coordinates.	
Clarification Request	<p><b><u>Clarification Request No. 1</u></b></p> <p>PP is requested to indicate the GPS coordinates (with decimal type) of the project site.</p>	
Response	<p>GPS coordinates of project site was as follow.</p> <p>Latitude 37.490000°, Longitude 127.094444°.</p> <p>The GPS coordinates has been updated in the revised MR and submitted to the audit team.</p>	

## List of Findings - Compilation and Resolutions

Version: 06 - Final

Project Title: "Switching of fuel from Low Sulphur Waxy Residue fuel oil to natural gas at Gangnam branch Korea District Heating Corporation Project"

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Clarification Requests by validation team		
Assessment	GPS coordinates of project site was as follow.	
Means of verification	The presented GPS coordinates, Latitude 37.490000°, Longitude 127.094444° have been verified with Google earth.	
Adjustment on project design OR Changes in the monitoring report or supporting annexes	The monitoring report was revised and attached in Annex 2. IRL # 3.	

Clarification Requests by validation team		
	Comments and Results	Conclusion and IRL
Issue	Daily fuel efficiency of project activity	<input checked="" type="checkbox"/> Finding Closed IRL # 6.
Requirement	The document for daily fuel efficiency should be provided for the cross-checking of fuel efficiency.	
Clarification Request	<b><u>Clarification Request No. 2</u></b> PP is requested to provide the supporting documents for the daily fuel efficiency to the audit team.	
Response	The daily fuel efficiency was submitted to the audit team together with raw data.	
Assessment Means of verification	The presented excel file, "KDHC_FuelSwitchCDM_MonitoringRawData" clearly shows the daily fuel efficiency.	
Adjustment on project design OR	No changes on MR neither PDD. The supporting document, the monitoring raw data is attached in Annex 2. IRL # 6.	

## List of Findings - Compilation and Resolutions

Version: 06 - Final

Project Title: "Switching of fuel from Low Sulphur Waxy Residue fuel oil to natural gas at Gangnam branch Korea District Heating Corporation Project"



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### Clarification Requests by validation team

Changes in the monitoring report or supporting annexes		
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### Clarification Requests by validation team

	Comments and Results	Conclusion and IRL
Issue	Uncertainty level of measuring equipments	<input checked="" type="checkbox"/> Finding Closed IRL # 28 ~ 39.
Requirement	The uncertainty of measuring equipment should be provided for assessing the soundness of data.	
Clarification Request	<b><u>Clarification Request No. 3</u></b> PP is requested to provide the supporting documents which show the uncertainty level of the each measuring equipments.	
Response	The documents for accuracy level of measuring equipment were submitted to DOE and the accuracy correctly stated in the revised monitoring report.	
Assessment Means of verification	The submitted documents were reviewed and compared with the accuracy statement in the revised MR. MR correctly stated the accuracy class of each monitoring meter.	
Adjustment on project design OR Changes in the monitoring report or supporting annexes	The monitoring report was revised and attached in Annex 2. IRL # 3. Also the several supporting documents were attached in Annex 2. IRL # 28 ~ 39.	

### Forward Action Requests by audit team

## List of Findings - Compilation and Resolutions

Version: 06 - Final

Project Title: "Switching of fuel from Low Sulphur Waxy Residue fuel oil to natural gas at Gangnam branch Korea District Heating Corporation Project"

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Forward Action Requests by audit team		
	Comments and Results	
Issue	Management of measuring equipments.	<input checked="" type="checkbox"/> Finding Closed
Requirement	Control of measuring equipment should be recorded for the transparency.	
Forward Action Request	<b><u>Forward Action Request No. 1</u></b> PP is required to record the trace of the measuring equipments. Auditor team requests PP to develop the record of monitoring equipment trail to keep the consistency of measuring equipment installation and Location numbers & Tag numbers.	
Response	PP will record the trace of the measuring equipments.	
Means of verification	Will be checked during next verification!	



## **Annex 2**

### **Information Reference List**

Information Reference List	Verification of CDM Project	Page 1 of 10	 Industrie Service
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**Project title:** “Switching of fuel from Low Sulphur Waxy Residue fuel oil to natural gas at Gangnam branch Korea District Heating Corporation Project”


**Document revision number:** 06

**Interviewed Persons during onsite audit:**


Name	Function	Company
Ms. Mi-Yeon Kim	Assistant manager / CDM responsible	Korea District Heating Corporation (hereinafter KDHC)
Mr. Kwang-Hee Jin	Gangnam Branch manager	KDHC
Mr. Chul-Gyun Kim	Manager	KDHC
Mr. Hae-Sik Choi	Manager	KDHC
Mr. Jeong-Ho Kim	Operation Engineer	KDHC
Mr. Hee-Cheol Won	Consultant	Ecoeye
Mr. Wang Jun	Consultant	Ecoeye

**Other Interviewed Persons (not during onsite audit):**


Name	Function	Institution/Company	Date of Interview
Mr. Sang-Hoon Jang	Consultant	Ecoeye	Several times (meetings & Phone calls)
Ms. Mi-Yeon Kim	Assistant manager / CDM responsible	KDHC	Several times (meetings & Phone calls)
Ms. Da-Jung Jung / Mr. Sang-Bae Seo	Consultant	Ecoeye	Several times (meetings & Phone calls)

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Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
0.	UNFCCC Webpage	“Switching of fuel from Low Sulphur Waxy Residue fuel oil to natural gas at Gangnam branch Korea District Heating Corporation Project” <a href="http://cdm.unfccc.int/Projects/DB/DNV-CUK1167217026.24/view">http://cdm.unfccc.int/Projects/DB/DNV-CUK1167217026.24/view</a>	Date of download of documents	<i>Reference to the PDD/MR chapter or CDM requirement</i>
1.	DNV	Validation Report of the registered project as published under cdm.unfccc.int www.unfccc.int/cdm/	01/12/2006	Validation Report
2.	KDHC	CDM Monitoring Report - Period #01 – 01/04/2008 - 31/03/2009 of “Switching of fuel from Low Sulphur Waxy Residue fuel oil to natural gas at Gangnam branch Korea District Heating Corporation Project” UNFCCC 0835 Version 01, Version 5, Version 6 & Version 7	14/05/2009 11/11/2011 30/05/2012 18/06/2012	MR version 01 MR version 05 MR version 06 MR version 07
3.	KDHC	1) Project Design Document for CDM project “Switching of fuel from Low Sulphur Waxy Residue fuel oil to natural gas at Gangnam branch Korea District Heating Corporation Project” version 1.03, dated on 18/02/2011 as available at cdm.unfccc.int 2) Project Design Document for CDM project “Switching of fuel from Low Sulphur Waxy Residue fuel oil to natural gas at Gangnam branch Korea District Heating Corporation Project” version 1.04, dated on 15/06/2012	18/02/2011  15/06/2012	PDD version 1.03 (Notification of PDD change)  PDD version 1.04 (Correction of PDD title)
4.	KDHC	KDHC_FuelSwitchCDM_ER_Calculation_Sheet_v5	11/11/2011	ER calculation
5.	Korean government	Business license of Gangnam branch for district heating – Initial and revised ones	19/07/1993 21/09/2005	Project approval
6.	KDHC	Monitoring raw data for whold period, from 01/04/2008 to 31/03/2009	11/11/2011	Raw data
7.	KDHC	Trend copy of heat generation for Boiler no. 5 for the whole monitoring period, from 01/04/2008 to 31/03/2009.	01/04/2008 to 31/03/2009	Heat generation trend copy

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Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
8.	KDHC	Trend copy of natural gas consumption amount for Boiler no. 5 for the whole monitoring period, from 01/04/2008 to 31/03/2009.	01/04/2008 to 31/03/2009	NG consumption trend copy
9.	KDHC	"CDM_Overall trend for all boilers" _1-year trends of LNG flow meters and Temperature meters for Boiler # 3, 4 and 5.	01/05/2008 to 31/03/2009	Trends of LFG flow and temperature
10.	KDHC	"CDM_Trend copies of Boiler 3" _ 1 month trends of LNG flow meters and Temperatures meters for the whole monitoring period, from 01/04/2008 to 31/03/2009.	01/04/2008 to 31/03/2009	Trends of LFG flow and temperature
11.	KDHC	"CDM_Trend copies of Boiler 4" _ 1 month trends of LNG flow meters and Temperatures meters for the whole monitoring period, from 01/04/2008 to 31/03/2009.	01/04/2008 to 31/03/2009	Trends of LFG flow and temperature
12.	KDHC	"CDM_Trend copies of Boiler 5" _ 1 month trends of LNG flow meters and Temperatures meters for the whole monitoring period, from 01/04/2008 to 31/03/2009.	01/04/2008 to 31/03/2009	Trends of LFG flow and temperature
13.	KDHC	"Daily operating reports" for April 2008 _ Detail log sheets for the operation of district heating facilities	April 2008	Boiler operation log sheet
14.	KDHC	"KDHC CDM program_Print screen" _ Print copy of KDHC IT system	10/09/2009	KDHC IT system
15.	KDHC	"NG consumptions and HG amount for all boilers" _ 1-year trends of Natural gas consumption and Heat generation amount for boiler no 3, 4 & 5 (for the whole monitoring period, from 01/04/2008 to 31/03/2009).	01/04/2008 to 31/03/2009	NG consumption and HG amount
16.	KDHC	"Non-operating period" _ extracted raw data to check the non operating duration of each boiler	01/04/2008 to 31/03/2009	Stoppage time of each boiler
17.	KDHC	1996 IPCC emission factor of fuels	10/09/2009	NCV values and Carbon emission factors for fuels

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Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
18.	Oval Korea	<p>Initial Calibration Certificates for 9 Gas Flow meters for boiler # 3, 4 and 5 issued by Oval Korea which is accredited by KOLAS</p> <p>3 Gas flow meter for Boiler #3 (Burner no. / Serial no. / Calibration day)</p> <ul style="list-style-type: none"> <li>- A burner: C15-S0539HN / 2006-06-17</li> <li>- B burner: C15-S0561HN / 2006-06-17</li> <li>- C burner: C15-S0554HN / 2006-06-18</li> </ul> <p>3 Gas flow meter for Boiler #4 (Burner no. / Serial no. / Calibration day)</p> <ul style="list-style-type: none"> <li>- A burner: C15-S0637HN / 2006-06-18</li> <li>- B burner: C15-S0635HN / 2006-06-19</li> <li>- C burner: C15-S0537HN / 2006-06-19</li> </ul> <p>3 Gas flow meter for Boiler #5 (Burner no. / Serial no. / Calibration day)</p> <ul style="list-style-type: none"> <li>- A burner: C15-S0633HN / 2006-06-20</li> <li>- B burner: C15-S0553HN / 2006-08-23</li> <li>- C burner: C15-S0655HN / 2006-08-22</li> </ul>	17/06/2006 18/06/2006 19/06/2006 20/06/2006 22/06/2006 23/06/2006	Calibration certificates of gas flow meters
19.	Honeywell	<p>Initial Calibration Certificate for 9 Temperature transmitters</p> <ul style="list-style-type: none"> <li>• TIT-5601/3/4: The calibrations were performed dated on 2006-06-16 by the manufacturer (Honeywell)</li> <li>• TIT-6601/3/4: The calibrations were performed dated on 2006-06-16 by the manufacturer (Honeywell)</li> </ul>	16/06/2006	Calibration certificates of Temperature Transmitter

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Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		<ul style="list-style-type: none"> <li>TIT-7601/3/4: The calibrations were performed dated on 2006-06-16 by the manufacturer (Honeywell).</li> </ul>		
20.	Jain Technology	Initial Calibration Certificate for 3 D.H. Water Flow meters which is accredited by KOLAS <ul style="list-style-type: none"> <li>FIT-2601/2/3: The calibrations were performed dated on 2006-08-17 by the third party, Jain Technology.</li> </ul>	17/08/2006	Calibration certificates of water flow meter
21.	Oval Korea	Periodic Calibration Certificates for 9 Gas Flow meters for boiler # 3, 4 and 5 issued by Oval Korea which is accredited by KOLAS  3 Gas flow meter for Boiler #3 (Burner no. / Serial no. / Calibration day) <ul style="list-style-type: none"> <li>- A burner: C15-S0539HN / 2008-06-10</li> <li>- B burner: C15-S0561HN / 2008-06-10</li> <li>- C burner: C15-S0554HN / 2008-06-09</li> </ul> 3 Gas flow meter for Boiler #4 (Burner no. / Serial no. / Calibration day) <ul style="list-style-type: none"> <li>- A burner: C15-S0637HN / 2008-06-09</li> <li>- B burner: C15-S0635HN / 2008-06-10</li> <li>- C burner: C15-S0537HN / 2008-06-09</li> </ul> 3 Gas flow meter for Boiler #5 (Burner no. / Serial no. / Calibration day) <ul style="list-style-type: none"> <li>- A burner: C15-S0633HN / 2008-06-10</li> <li>- B burner: C15-S0553HN / 2008-06-10</li> <li>- C burner: C15-S0655HN / 2008-06-09</li> </ul>	09/06/2008 10/06/2008	Calibration certificates of gas flow meters

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Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
22.	KRISS (Korea Research Institute of Standard and Science)	Periodic Calibration Certificate for 9 Temperature transmitters <ul style="list-style-type: none"> <li>TIT-5601/3/4: The calibrations were performed dated on 2008-06-24 by the third party KRISS (Korea Research Institute of Standard and Science)</li> <li>TIT-6601/3/4: The calibrations were performed dated on 2008-06-24 by the third party KRISS (Korea Research Institute of Standard and Science)</li> <li>TIT-7601/3/4: The calibrations were performed dated on 2008-06-24 by the third party KRISS (Korea Research Institute of Standard and Science)</li> </ul>	24/06/2008	Calibration certificates of Temperature Transmitter
23.	Daeduck Technology	Periodic Calibration Certificate for 3 D.H. Water Flow meters issued by Daeduck Technology which is accredited by KOLAS <ul style="list-style-type: none"> <li>FIT-2601/2/3: The calibrations were performed dated on 2008-06-17 by the third party, Jain Technology.</li> </ul>	17/06/2008	Calibration certificates of water flow meter
24.	Honeywell	Initial Calibration Certificate for 3 Temperature transmitters for LNG gas <ul style="list-style-type: none"> <li>TIT-5301: The calibrations were performed dated on 2006-06-16 by the manufacturer (Honeywell)</li> </ul>	16/06/2006	Calibration certificates of Temperature Transmitter

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Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		<ul style="list-style-type: none"> <li>TIT-6301: The calibrations were performed dated on 2006-06-16 by the manufacturer (Honeywell)</li> <li>TIT-7301: The calibrations were performed dated on 2006-06-16 by the manufacturer (Honeywell).</li> </ul>		
25.	Honeywell	Initial Calibration Certificate for 3 Pressure Transmitter for LNG gas <ul style="list-style-type: none"> <li>PIT-5301: The calibrations were performed dated on 2006-06-22 by the manufacturer (Honeywell)</li> <li>PIT-6301: The calibrations were performed dated on 2006-06-22 by the manufacturer (Honeywell)</li> <li>PIT-7301: The calibrations were performed dated on 2006-06-22 by the manufacturer (Honeywell).</li> </ul>	22/06/2006	Calibration certificates of Pressure Transmitter
26.	Korea Testing Laboratory	Periodic Calibration Certificate for 3 Temperature transmitters for LNG gas <ul style="list-style-type: none"> <li>TIT-5301: The calibrations were performed dated on 2008-07-07 by the third party, KTL (Korea Testing Laboratory)</li> <li>TIT-6301: The calibrations were performed dated on 2008-07-07 by the third party, KTL (Korea Testing Laboratory)</li> </ul>	07/07/2008	Calibration certificates of Temperature Transmitter

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Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		<ul style="list-style-type: none"> <li>TIT-7301: The calibrations were performed dated on 2008-07-07 by the third party, KTL (Korea Testing Labarotory)</li> </ul>		
27.	Korea Testing Laboratory	Periodic Calibration Certificate for 3 Pressure transmitters for LNG gas <ul style="list-style-type: none"> <li>PIT-5301: The calibrations were performed dated on 2008-07-07 by the third party, KTL (Korea Testing Labarotory)</li> <li>PIT-6301: The calibrations were performed dated on 2008-07-07 by the third party, KTL (Korea Testing Labarotory)</li> <li>PIT-7301: The calibrations were performed dated on 2008-07-07 by the third party, KTL (Korea Testing Labarotory)</li> </ul>	07/07/2008	Calibration certificates of Temperature Transmitter
28.	KDHC & Gangwon Boiler	Performance test report with technical specification of Natural gas HOBs	09/06/2009	Technical specification
29.	KDHC & Gangwon Boiler	Operation manual of Natural gas HOBs	31/05/2007	Operation manual
30.	KDHC	Technical specification of UPS	09/06/2009	Technical specification
31.	KDHC	P & ID (Piping & Instrumentation Diagram)	06/2005	Checking monitoring points
32.	KDHC	Technical specification _Flow meter for D.H(UFC030F)	09/06/2009	Technical

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Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
				specification
33.	KDHC	Instrument Data sheet_Gas flow meters(VXF1150) containing - Technical specification / Calculation sheet / Drawings / Catalogs	09/06/2009	Technical specification
34.	KDHC	Technical specification_Temperature transmitter(STT250) indicating accuracy and measuring range	09/06/2009	Technical specification
35.	KDHC	Pressure gauge and transmitter (STG944)(honeywell)	09/06/2009	Technical specification
36.	KDHC	Accuracy and measuring range of Gas flow meter	09/10/2009	Accuracy and measuring range
37.	KDHC	Accuracy and measuring range of Temp. meter	09/10/2009	Accuracy and measuring range
38.	KDHC	Accuracy and measuring range of Pressure meter	09/10/2009	Accuracy and measuring range
39.	KDHC	Accuracy and measuring range of water flow meter	09/10/2009	Accuracy and measuring range
40.	KDHC	CDM project monitoring procedures_EMI-S-59 dated April 1 2008	01/04/2008	Monitoring procedures
41.	Standards	Measuring equipment control procedures_EMI-K-6 dated April 13, 2002	13/04/2002	Procedures for meters
42.	KDHC	Training plan_EMP-4 dated March 2008	03/2008	Training plan
43.	KDHC	Emergency plan_EMP-6 dated March 2008	03/2008	Emergency plan

Information Reference List	Verification of CDM Project	Page 10 of 10	 Industrie Service
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Ref No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
44.	KDHC	Monitoring equipment control card	09/06/2009	Meter control card
45.	KDHC	The official letter for requesting MOC (Modality of Communication) change	28/10/2008	MOC change letter
46.	KDHC	Training schedule for year 2008 with official letter	26/06/2008 ~ 27/06/2008	Training schedule
47.	KDHC	Seminar plan for the 2 <sup>nd</sup> half of year 2008	October 2008	Seminar for training employees
48.	Daehan City gas Co., Ltd	LNG invoice from LNG supplier, Daehan City Gas Co., Ltd.	May 2008 March 2009	LNG invoices
49.	KDHC, SGS & Daehan City Gas Co., Ltd	Official letter from KDHC include the certificate of LSWR from SGS & e-mail letter from Daehan City Gas Co., Ltd	Various	NCV values of LSWR & LNG
50.	KDHC	Official letter from KDHC for the correction of the project title in PDD	15/06/2012	Correction of the project title in PDD



## **Annex 3**

### **Appointment Certificates**



Industrie Service

# CERTIFICATE OF APPOINTMENT

Mr Köhn, Robert, fulfills the requirements of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH to participate in audits.

Qualification applicable to						
Standard	CDM	JI	GS	VCS	VER	Other
Date	13.04.11					

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		13.04.11	13.04.11	13.04.11		

Other qualification					
Country Expertise					
Region	1	2	3	4	5
Date	13.04.11				
Financial Expertise					
Date	13.04.11				

Qualification in technical areas	
Technical Area	Date
1.2_Energy generation from renewable energy source	13.04.11
4.6_Electric and electronic industry	13.04.11

This appointment is valid for 1 year from its date of signature below and is bound by internal requirements of the Management System of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH.

In case of loss of validity of this certificate as per result of an assessment according internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference No. CMS-Z-0044/02.

Date	Signature
13.04.12 Extension of validity	



Industrie Service

# CERTIFICATE OF APPOINTMENT

Mr Jung-Ho, Yoon, fulfills the requirements of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH to participate in audits.

Qualification applicable to						
Standard	CDM	JI	GS	VCS	VER	Other
Date	27.04.11					

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		27.04.11	27.04.11			

Other qualification					
Country Expertise					
Region	1	2	3	4	5
Date	27.04.11				
Financial Expertise					
Date					

Qualification in technical areas	
Technical Area	Date
13.1_Waste handling and disposal	27.04.11

This appointment is valid for 1 year from its date of signature below and is bound by internal requirements of the Management System of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH.

In case of loss of validity of this certificate as per result of an assessment according internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference No. CMS-Z-0048/02.

Date	Signature
27.04.12 Extension of validity	<i>Thomas Klein</i>



Industrie Service

# CERTIFICATE OF APPOINTMENT

Mr Yoshida, Yutaka, fulfills the requirements of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH to participate in audits.

Qualification applicable to						
Standard	CDM	JI	GS	VCS	VER	Other
Date	25.03.11					

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		25.03.11	25.03.11	25.03.11		

Other qualification					
Country Expertise					
Region	1	2	3	4	5
Date	25.03.11				
Financial Expertise					
Date					

Qualification in technical areas	
Technical Area	Date
3.1_Energy demand	25.03.11
5.1_4.9_11.1_12.1_Chemical process industries	25.03.11
11.2_GHG capture and destruction	25.03.11
1.1_4.10_Thermal energy generation...	12.10.11
1.2_Energy generation from renewable energy source	12.10.11
13.1_Waste handling and disposal	12.10.11
2.1_Electricity distribution	12.10.11

This appointment is valid for 1 year from its date of signature below and is bound by internal requirements of the Management System of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH.

In case of loss of validity of this certificate as per result of an assessment according internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference No. CMS-Z-0026/03.

Date	Signature
25.03.12 Extension of Validity	



Industrie Service

# CERTIFICATE OF APPOINTMENT

Mr Hammer, Martin, fulfills the requirements of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH to participate in audits.

Qualification applicable to						
Standard	CDM	JI	GS	VCS	VER	Other
Date	23.03.11					

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		23.03.11	23.03.11	23.03.11		

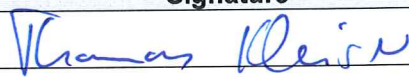
Other qualification					
Country Expertise					
Region	1	2	3	4	5
Date	23.03.11				
Financial Expertise					
Date	23.03.11				

Qualification in technical areas	
Technical Area	Date
1.2_Energy generation from renewable energy source	23.03.11
5.1_4.9_11.1_12.1_Chemical process industries	23.03.11

This appointment is valid for 1 year from its date of signature below and is bound by internal requirements of the Management System of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH.

In case of loss of validity of this certificate as per result of an assessment according internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference No. CMS-Z-0005/02.

Date	Signature
23.03.12 Extension of Validity	



Industrie Service

# CERTIFICATE OF APPOINTMENT

Mr Grugni, Luciano, fulfills the requirements of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH to participate in audits.

Qualification applicable to						
Standard	CDM	JI	GS	VCS	VER	Other
Date	23.03.11					

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		23.03.11	23.03.11			

Other qualification					
Country Expertise					
Region	1	2	3	4	5
Date	23.03.11				
Financial Expertise					
Date					

Qualification in technical areas	
Technical Area	Date
1.1_4.10_Thermal energy generation...	23.03.11
1.2_Energy generation from renewable energy source	23.03.11
2.2_Heat distribution	23.03.11
13.1_Waste handling and disposal	05.05.11

This appointment is valid for 1 year from its date of signature below and is bound by internal requirements of the Management System of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH.

In case of loss of validity of this certificate as per result of an assessment according internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference No. CMS-Z-0021/02.

Date	Signature
23.03.12 Extension of Validity	