



VALIDATION REPORT

VALIDATION OPINION FOR THE REVISED
MONITORING PLAN:

LG Chem Naju plant fuel switching project

UNFCCC Ref. No. 2475

REPORT No. 2011-08

VERSION 01.4

VALIDATION REPORT

Date of first issue: 21 July 2011	Date of this revision 27 January 2012	Project No.: COP-100
Approved by: Jong Mun PARK Date : 30 January 2012	Organisational unit: Korean Foundation for Quality (KFQ)	
Client: LG Chem. Ltd.	Client ref.: Bahnsuk Kim	

Summary:

Project Title : LG Chem Naju plant fuel switching project

Annex-I Country : Japan

Host Country : Republic of Korea

Project Participants : LG Chem. Ltd.
Mitsubishi UFJ Morgan Stanley Securities Co., Ltd

Applied Methodology(Ver.) : AMS-III.B (Version 12) “Switching fossil fuels”

Sectoral Scope : SS 1 – Energy industries (renewable-/non-renewable sources)

Technology/Measure to be employed : Fuel switching from bunker fuel oil C to natural gas



Crediting Period : 10 years fixed crediting period (Starting from 6th April 2009)

Estimated ER : 19,635 ton CO₂e/year

Project Size : Small Scale

As the result of the validation for revised monitoring plan of the project, it can be confirmed that **LG Chem Naju plant fuel switching project** as described in the revised monitoring plan, meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the baselines and monitoring methodology AMS-III.B (Version 12).

KFQ, thus, requests the revision of MP of the registered project.

Work carried out by :  Sung Han YOON (Audit team leader, GHG auditor) Mi Jung LEE (Audit team member, GHG auditor) Nam Hoon KIM (Observer) Eu Park HWANG (Technical Expert)	Work Verified by :  Jong Mun PARK
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Abbreviations

CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide Equivalent
DOE	Designated Operational Entity
ER	Emission Reduction
GHG	Greenhouse gas(es)
KFQ	Korean Foundation for Quality
MP	Monitoring Plan
NCV	Net Calorific Value
NG	Natural Gas
PDD	Project Design Document
PP	Project Participant
UNFCCC	United Nations Framework Convention for Climate Change

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1 INTRODUCTION

Korean Foundation for Quality (KFQ) has been engaged by LG Chem Ltd. to perform a validation of revised monitoring plan of the ‘LG Chem Naju plant fuel switching project (UNFCCC Ref. No. 2475)’ in Republic of Korea. This validation report summarizes the findings and/or opinion for the revised monitoring plan validation, performed on the basis of applied methodology (AMS-III.B version 12) and “Procedures for revising monitoring plans in accordance with paragraph 57 of the modalities and procedures for the CDM(version 02)” in annex 28 of EB49 meeting report.

1.1 Objective

Paragraph 57 of the modalities and procedures for the CDM allows project participants to revise monitoring plans in order to improve accuracy and/or completeness of information, subject to the revision being validated by a DOE. The purpose of a validation of revised monitoring plan is to have an independent third party assessment of the project's monitoring plan revision. In particular, the level of accuracy or completeness in the proposed revision of the monitoring plan, and the conformity with approved monitoring methodology applicable to the project activity.

1.2 Scope

The validation scope is defined as an independent and objective review of the revised MP and other relevant documents. The information in these documents is reviewed against the approved methodology (AMS-III.B version 12) and relevant decisions by the CDM Executive Board.

The validation 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 GHG Project Description

As per URL of <http://cdm.unfccc.int/Projects/DB/KFQ1239109023.91/view>, there is no change in the project activity description. The project was registered on 4th June 2009 under UNFCCC Ref. No. 2475

1.4 Validation Team

The validation team consisted as follows:

Sung Han YOON (Audit team Leader, GHG auditor)

Mi Jung LEE (Audit team member, GHG auditor)

Nam Hoon KIM (observer)

Eu Park HWANG (Technical Expert)

Technical review was implemented by technical reviewer, Jong Mun PARK.

The qualification of each individual validation team member is detailed in Appendix to this report.

2 METHODOLOGY

2.1 Desk review of the Documents

The revised monitoring plan submitted by the client and additional background documents related to further monitoring aspects were reviewed as initial step of the validation process.

2.2 Follow-up Interviews with Project Stakeholders

In the period of 5 July 2011, KFQ performed interviews with the project stakeholders to confirm selected information and to resolve issues identified in the document review. The main topics of the interviews are summarized under table.

Interviewed organisation	Interview topics
LG Chem Ltd. - Jaee YOUK - SungHee WON - Boyeon Hur - Young Ju KO	➤ Revised Monitoring plan ➤ Project Implementation ➤ Monitoring parameters listed in the PDD and revised MP ➤ Installed equipment(new flow meter) specification ➤ The location of monitoring equipment ➤ Responsibility and authority ➤ Calibration characteristics and practice
Mitsubishi UFJ Morgan Stanley - Takeshi Miyata - Christopher Faulkner	

2.3 Internal Quality Control

According to KFQ's Procedure for deciding whether proceeded a request for revising monitoring plan, the validation report and validation findings underwent a technical review before being submitted a request for revising monitoring plan. The technical review was performed by a technical reviewer qualified in accordance with KFQ's qualification scheme for CDM validation and verification.

3 VALIDATION FINDINGS

3.1 Participation Requirements

As per the validation report by KFQ, dated 1st June 2009 available on UNFCCC webpage <http://cdm.unfccc.int/Projects/DB/KFQ1239109023.91/view>. No changes have been made.

3.2 Project Design

As per the validation report by KFQ, dated 1st June 2009 available on UNFCCC webpage <http://cdm.unfccc.int/Projects/DB/KFQ1239109023.91/view>. No changes have been made.

3.3 Additionality

As per the validation report by KFQ, dated 1st June 2009 available on UNFCCC webpage <http://cdm.unfccc.int/Projects/DB/KFQ1239109023.91/view>. No changes have been made.

3.4 The revision of Monitoring Plan

The validation team confirmed that the revised monitoring plan is in line with the monitoring methodology (AMS-III.B version 12) and paragraph 57 of the modalities and procedures for the CDM. And the revised MP is not reduced the level of accuracy and completeness in the monitoring and verification process and there will be no impact in the emission reduction calculations.

The validation findings in the revised monitoring plan are as follows:

3.4.1 Revision of measuring equipment for $FF_{project,y}$

Emission reduction calculation of the project is as follows;

$$PE_y = FF_{project,y} \cdot NCV_{NG} \cdot EF_{NG,CO2}$$

PE_y : Project emissions during the year y (tCO₂e)

$FF_{project,y}$: Quantity of natural gas combusted in the project boiler during the year y (m³)

NCV_{NG} : Net calorific value of the natural gas combusted (TJ/m³)

$EF_{NG,CO2}$: emission factor of the natural gas combusted in the project boiler (tCO₂/TJ)

$$BE_y = EF_{baseline} \cdot Q_y$$

BE_y : Baseline emission during the year y (tCO₂e)

$EF_{baseline}$: Baseline emission factor for the baseline situation (tCO₂/TJ)

Q_y : Quantity of steam generated by natural gas (TJ)

Baseline emission factor for the baseline situation is calculated as follows:

$$EF_{baseline} = FF_{baseline} \cdot EF_{baseline,CO2} \cdot NCV_{baseline} / Q_{baseline}$$

$FF_{baseline}$: Quantity of bunker fuel oil C combusted in the baseline situation (liter)

$EF_{baseline,CO_2}$: CO₂ emission factor of bunker fuel oil C (tCO₂/TJ)

$NCV_{baseline}$: Net calorific value of bunker fuel oil C (TJ/liter)

$Q_{baseline}$: Quantity of steam generated by bunker fuel oil C in the baseline situation (TJ)

Since purge gas and by-product liquid fuel are also combusted in the boiler, quantity of steam generated by natural gas and quantity of steam generated by bunker fuel oil C is calculated based on the proportion of fuel used as follows:

$$Q_y = Q_{total,y} \times \frac{FF_{project,y} \times NCV_{NG}}{(FF_{project,y} \times NCV_{NG} + PG_y \times NCV_{PG,y} + LF_y \times NCV_{LF,y})}$$

$Q_{total,y}$ Total quantity of steam generated by natural gas, waste gas and by-product liquid fuel during year y (TJ)

PG_y Quantity of purge gas combusted in the boiler during year y (Nm³)

$NCV_{PG,y}$ Net calorific value of purge gas (TJ/Nm³)

LF_y Quantity of by-product liquid fuel combusted in the boiler during year y (liter)

$NCV_{LF,y}$ Net calorific value of by-product liquid fuel (TJ/liter)

$$Q_{baseline} = Q_{total,baseline} \times \frac{FF_{baseline} \times NCV_{baseline}}{(FF_{baseline} \times NCV_{baseline} + PG_{baseline} \times NCV_{PG,baseline} + LF_{baseline} \times NCV_{LF,baseline})}$$

$Q_{total,baseline}$ Total quantity of steam generated by bunker fuel oil C, waste gas and by-product liquid fuel in the baseline situation (TJ)

$PG_{baseline}$ Quantity of purge gas combusted in the boiler in the baseline situation (Nm³)

$NCV_{PG,baseline}$ Net calorific value of purge gas (TJ/Nm³)

$LF_{baseline}$ Quantity of by-product liquid fuel combusted in the boiler in the baseline situation (liter)

$NCV_{LF,baseline}$ Net calorific value of by-product liquid fuel (TJ/liter)

$$ER_y = BE_y - PE_y$$

As above, $FF_{project,y}$ is quantity of natural gas combusted in the project boiler during the year y and major parameter for ER calculation of the project. It is planned to be measured with the meter (Tag No. FQ_7000; hereafter called it meter 7000) in the registered PDD and meter 7000 is the meter for natural gas sales bill and it belongs to gas provider (Hae Yang City Gas).

When the PDD was drawn up, fuel switched boiler of the project activity was only one natural gas consumption facility in the plant. However, after registration, PP has extended use of natural gas to other facility since December 2009 and it is branched from the natural gas pipeline (after the meter 7000). Thus, the meter 7000 measures the natural gas consumption of project activity as well as the other consumption.

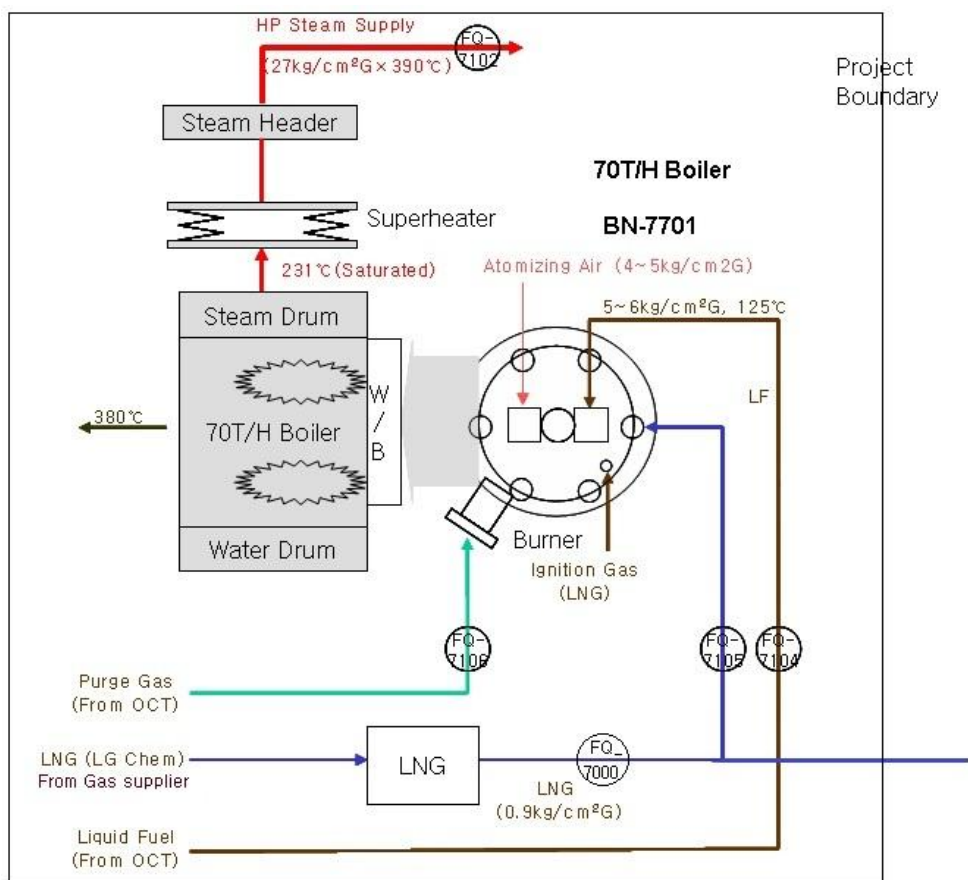
Due to above reason, PP have changed monitoring point of $FF_{\text{project,y}}$ to another flow meter (Tag No. FQ_7105; hereafter called it meter 7105) located in front of the boiler for natural gas consumption in the project boiler. The meter 7105 was installed at the time of construction for project activity and PP have been measuring and recording the consumption of natural gas in the project activity. Therefore, the meter 7105 will be used instead of meter 7000 for $FF_{\text{project,y}}$. (Refer to Figure 1).

The specifications of two natural gas flow meters are as <Table 1>:

Meter 7000 and 7105 have same level of accuracy to measure natural gas consumption as shown in the table 1 below. Hence, the validation team could conclude that the change from meter 7000 to meter 7105 does not reduce the accuracy of emission reduction calculation.

<Table 1> The specification of two flow meters (Tag No. FQ_7000 and 7105)

Flow meter Tag NO.	FQ_7000	FQ_7105
Type (Model)	Turbine meter (TRZ-2/G650)	Vortex meter (VXW1150-N11G-1116)
Manufacturer	Elster	Oval
Accuracy	$\pm 1\%$	$\pm 1\%$



<Figure 1> the monitoring diagram for the project activity

The calibration for the meter 7000 was planned periodically according to internal regulation of the gas supplier (based on national regulation) in the registered PDD. It means once every 8 years. Whereas the meter 7105 which belongs to PP, will be calibrated at least every 3 years (according to General Guidelines to SSC CDM methodologies-ver.17)

Also, PP plans that the amount of natural gas consumption in the project boiler will be cross checked with the value of receipt of natural gas purchase minus other natural gas consumption data supplied from same LNG supply line. All the meters used in cross-check will be calibrated according to national standard or related guideline.

In the revised MP, PP also provided corrective action to be taken for the case that erroneous measurement or malfunction. The corrective actions will be taken by LG Chem based on the revised MP. According to the revised MP, when reading error, which measuring values from the meter for $FF_{project,y}$ exceed the historical and meaningful range, occurs, the boiler will be shut down and not be restarted until the meter is properly repaired and calibration followed in accordance with the standard. In case where the monitoring data is found to be incorrect due to the malfunction, PP will formulate and justify to get $FF_{project,y}$ in a reasonable and conservative way through comparison of available data such as historical monthly data, cross-checked data, and other data to estimate the value(ex, steam generation data). The details are as below:

In case where the monitoring data is found to be incorrect in a certain month when malfunction of meter occurred, PP will formulate reasonable and conservative estimation. In the case of a malfunction, the PP will calculate:

- a) the maximum monthly natural gas consumption value taken from a sample of the previous 12 months;
- b) back calculate monthly natural gas consumption value based on the amount of steam generated, the types of fuel consumed, and the concomitant net calorific values of each fuel type in the month when the malfunction occurred; and
- c) estimate the natural gas consumed by the project based on receipt of purchase and meter readings from all other natural gas consumption points in the plant.

$FF_{project,y}$ is used in both baseline and project emissions calculations according to the registered PDD. As per para 209(a) of the VVM, it should be ensured that the most conservative assumption theoretically possible has been made in which the data were not available because activity levels or non-activity parameters were not monitored. In order to make the most conservative calculation possible, it will be chosen the value for $FF_{project,y}$ resulting in the lowest CERs value. In other words, according to the revised monitoring plan, being the highest value among a), b), and c) for $FF_{project,y}$ will be applied in the PE calculation and the lowest value among a), b), and c) for $FF_{project,y}$ will be applied in the BE calculation instead of sum of daily data over the month for $FF_{project,y}$ respectively.

The validation team confirms that the revised monitoring plan to determine the consumption of natural gas is appropriate and valid for calculating emission reduction and the level of accuracy or completeness in the monitoring and verification process is not reduced as a result of the revision and it is still in accordance with the approved monitoring methodology. And also the corrective action for erroneous measurement or malfunction is valid and reasonable.

The rest of the monitoring plan remains the same as mentioned in the registered PDD available at UNFCCC website <http://cdm.unfccc.int/Projects/DB/KFQ1239109023.91/view>. And It is also checked that the emission reduction calculation and the responsibilities & authorities of monitoring parameters and maintenance does not change due to the revision of monitoring plan as described above.

3.5 Environmental Impacts

As per the validation report by KFQ, dated 1st June 2019 available on UNFCCC webpage <http://cdm.unfccc.int/Projects/DB/KFQ1239109023.91/view>. No changes have been made.

3.6 Comments by Localstakeholders

As per the validation report by KFQ, dated 1st June 2019 available on UNFCCC webpage <http://cdm.unfccc.int/Projects/DB/KFQ1239109023.91/view>. No changes have been made.

4 VALIDATION OPINION

Korean Foundation for Quality (KFQ) has performed a validation of the revised Monitoring Plan of CDM project Ref. No. 2475: LG Chem Naju plant fuel switching project.

The validation is based on the information made available to us and the engagement conditions. And the review of the revised monitoring plan, supporting documents, and the subsequent follow-up interviews has conducted with sufficient evidence to determine the fulfillment of all stated criteria.


In our opinion, the revised monitoring plan meets all relevant UNFCCC requirements for the CDM.

Hence, it can be confirmed that:

- a. The level of accuracy or completeness in the monitoring and verification process is not reduced as a result of the revision, also can be confirmed that the proposed revision is in accordance to the project activity.
- b. The proposed revision of the monitoring plan is in accordance with the approved monitoring methodology applicable to the project activity.

Therefore, KFQ recommends the replacement of the monitoring plan of the registered PDD as the submitted revision.

Signed on behalf of the Korean Foundation for Quality

Signature : 

Name : Jong Mun PARK

Date : 30 January 2012

5. REFERENCES

1. Revised monitoring plan of LG Chem Naju plant fuel switching project (Clean/Track version)
2. Registered PDD of LG Chem Naju plant fuel switching project (Ref. No. : 2475)
3. Validation Report of “LG Chem Naju plant fuel switching project”
(KFQ, version 02.1 dated 1st June 2009)
4. Methodology:
Applied methodology in the registered PDD
- AMS-III.B (version 12) : Switching fossil fuels
5. Data sheet of flow meter and name plate of installed flow meter (Tag No. FQ_7105,
Manufacturer: Oval, model : VXW1150-N11G-1116)
6. Specification of flow meter (Tag No. FQ_7000, Manufacturer: Elster, model : TRZ2 G650)
7. Construction completion confirmation document for fuel switching boiler (incl. Monitoring
equipment installation), 23 November 2006
8. CDM Validation and Verification Manual (EB55 Annex 1, version 1.2)

Appendix
Qualification of Validation Team
and Technical Reviewer



CERTIFICATE OF COMPETENCE

Name: Sung Han YOON

Qualification:

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

Scopes of Expertise:

Technical Area (TA)

- 1.2 Energy generation from renewable energy sources
- 11.2 GHG capture and destruction.
- 13.1 Waste handling and disposal

Approved by Qualification Committee of KFQ on 17 November 2011

Sustainability Management Institute
Nam Hoon KIM

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CERTIFICATE OF COMPETENCE

Name: Mi Jung LEE

Qualification:

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

Scopes of Expertise:

Technical Area (TA)

1.2 Energy generation from renewable energy sources

Approved by Qualification Committee of KFQ on 28 February 2011

Sustainability Management Institute
Byung Yong LEE

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CERTIFICATE OF COMPETENCE

Name: EU-PARK HWANG

Qualification:

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

Scopes of Expertise:

Technical Area (TA)

- 1.1 Thermal energy generation from fossil fuels and biomass including thermal electricity from solar
- 4.4 Refinery
- 10.2 Oil and gas industry, coal mine methane recovery and use

Approved by Qualification Committee of KFQ on 17 November 2011

Sustainability Management Institute
Nam Hoon KIM

A handwritten signature in black ink, appearing to read 'Nam Hoon KIM', is written over a faint, light-colored circular stamp.



CERTIFICATE OF COMPETENCE

Name: Jong Mun PARK

Qualification:

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

Scopes of Expertise:

Technical Area (TA)

- 1.1 Thermal energy generation from fossil fuels and biomass including thermal electricity from solar

Approved by Qualification Committee of KFQ on 17 November 2011

Sustainability Management Institute
Nam Hoon KIM

A stylized, handwritten signature in black ink, appearing to read 'Hoon Kim'.