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# VALIDATION REPORT

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LG CHEM NAJU PLANT FUEL SWITCHING PROJECT


REPORT No. 2009-06

REVISION No. 02

**KOREAN FOUNDATION FOR QUALITY**



## VALIDATION REPORT

Date of first issue: 20 March 2009	Date of this revision 07 March 2009	Project No.: EC-828
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Client: Mitsubishi UFJ Securities Co.,Ltd	Client ref.: Masayuki Toyofuku	

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### Summary:

**Project Title :** LG Chem Naju plant fuel switching project

**Investor Country :** Japan

**Host Country :** Republic of Korea

**Project Participants :** LG Chem,Ltd.

Mitsubishi UFJ Securities Co.,Ltd

**Applied Methodology(ver) :** AMS-III.B (Version 12)

**Sectoral Scope :** 1-Energy Industries (Renewable-/non-renewable sources)

**Technology/Measure to be employed :** Fuel Switching

**Crediting Period :** 10 years

**Estimated ER :** 19,635 ton CO<sub>2</sub>/yr

**Project Size :** Small-Scale

### Validation Report Status

☐ CAR/CL Requested

☐ Before DNA approval

☐ Resolution of Outstanding issues

☒ Full approval and submission for registration

As the result of the validation, it can be confirmed that LG Chem Naju plant fuel switching project as described in the revised PDD of 13 March 2009 (Ver.10.3), meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the simplified baselines and monitoring methodology AMS-III.B (Ver.12). KFQ thus requests the registration of the project as a CDM project activity.

Work carried out by :

Jong Moon PARK (Audit team Leader, GHG auditor)

Mi Jung LEE(Audit team member, GHG auditor)

Pyung Hee Jang (Audit team member, Observer)

Work Verified by :

Yu Shim JEONG





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VALIDATION REPORT

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**Abbreviations**

BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CL	Clarification request
CO <sub>2</sub>	Carbon dioxide
CO <sub>2e</sub>	Carbon dioxide Equivalent
DNA	Designated National Authority
GHG	Greenhouse gas(es)
KEPCO	Korea Electric Power Company
KFQ	Korean Foundation for Quality
MoV	Means of verification
MP	Monitoring Plan
NGO	Non-governmental Organisation
ODA	Official Development Assistance
OM	Operating Margin
PDD	Project Design Document
UNFCCC	United Nations Framework Convention for Climate Change

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**VALIDATION REPORT**


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Appendix A: Validation Protocol

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## **1 INTRODUCTION**

Korean Foundation for Quality (KFQ) has been engaged by Mitsubishi UFJ Securities Co.,Ltd to perform a validation of the 'LG Chem Naju plant fuel switching project' in Republic of Korea('Korea)'. This validation report summarizes the findings of the validation of the project, performed on the basis of UNFCCC and host party's criteria for CDM project, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures and the subsequent decisions by the CDM Executive Board.

All the validation team's conclusion and opinion on this project activity are made the PDD of version 10.3, 13 March 2009, as a basis. Final PDD has followed the structure and guidance in the latest relevant PDD template (CDM-SSC-PDD, Ver. 03) and the Simplified project design document (CDM-SSC-PDD) & the form for proposed new small-scale methodology (CDM-SSC-NM) (Ver. 07).

The Project is classified with sectoral scope 1- Energy Industries (renewable-/non-renewable sources) and the project activity consists of investments to adapt the existing equipment to the use natural gas instead of fuel oil, Bunker fuel oil C. The project site is located in Songwal-dong, Naju, Jeollanam-do of Korea.

According to Appendix C to the simplified modalities and procedures for small scale CDM project activities, the project is not part of a larger CDM project activity. As verified during the site visit, LG Chem,Ltd has only implemented this project with the aim to register under the CDM.

The estimated amount of GHG emission reductions from the project is calculated to be 19,635 t CO<sub>2</sub>e during the fixed credit period, resulting in estimated average annual emission reductions of 196,350 t CO<sub>2</sub>e.

### **1.1 Objective**

The purpose of a validation is to have an independent third party assess the project design. In particular, the project's baseline, the monitoring plan (MP), and the project's compliance with relevant UNFCCC and host countries criteria are validated in order to confirm that the project design as documented is sound and reasonable and meets the stated requirements and identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

## **1.2 Scope**

The validation scope is defined as an independent and objective review of the project design document (PDD), the project's baseline study, monitoring plan and other relevant documents. The information in these documents is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed on the Marrakech Accords and the relevant decisions by the CDM Executive Board including the approved baseline and monitoring methodology. KFQ has, based on the recommendations in the Validation and Verification Manual employed a risk-based approach in the validation, focusing on the identification of significant risks for project implementation and the generation of CERs.

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 Validation Team**

The validation team consisted as follows:

Jong Mun PARK (Audit team Leader, GHG auditor)

Mi Jung LEE (Audit team member, GHG auditor)

Pyung Hee Jang (Audit team member, Observer)

Validation work is verified by a technical reviewer, Yu Shim JOENG and the qualification of each individual validation team member is detailed in Appendix B to this report.

## **2 METHODOLOGY**

The validation consists of the following three phases:

- I a desk review of the project design documents
- II follow-up interviews with project stakeholders
- III The resolution of outstanding issues and the issuance of the final validation report and opinion.

In order to ensure transparency, a validation protocol for CDM project was customized for the project, according to the Validation and Verification Manual. The protocol shows, in a transparent manner, criteria (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

- It organizes details and clarifies the requirements a CDM project is expected to meet;
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of three tables. The different columns in these tables are described in Figure 1. The completed validation protocol is enclosed in Appendix A to this report.

Findings established during the validation can either be seen as a non-fulfilment of validation protocol criteria or where a risk to the fulfilment of project objectives is identified. Corrective Action Requests (CAR) are issued, where:

- i) mistakes have been made with a direct influence on project results;
- ii) validation protocol requirements have not been met; or
- iii) there is a risk that the project would not be accepted as a CDM project or that emission reductions will not be certified.

The term Clarification (CL) is issued where information is insufficient, unclear or not transparent enough to establish whether a requirement is met.

The validation team has assessed the proposed CAR with a positive result and after the closure of these CAR and CL the proponent has issued the final version of the PDD. On the basis of this the final validation report and opinion were issued.

<b>Validation Protocol Table 1: Mandatory Requirements for Clean Development Mechanism Project Activity</b>			
<b>Requirement</b>	<b>Reference</b>	<b>Conclusion</b>	<b>Cross reference/Comment</b>
<i>The requirements the project must meet.</i>	<i>Gives reference to the legislation or agreement where the requirement is found.</i>	<i>This is either acceptable based on evidence provided (OK), or a <b>Corrective Action Request (CAR)</b> of risk or non-compliance with stated requirements. The corrective action requests are numbered and presented to the client in the Validation report.</i>	<i>Used to refer to the relevant checklist questions in Table 2 to show how the specific requirement is validated. This is to ensure a transparent Validation process.</i>

<b>Validation Protocol Table 2: Requirement checklist</b>				
<b>Checklist Question</b>	<b>Reference</b>	<b>Means of verification (MoV)</b>	<b>Comment</b>	<b>Draft and/or Final Conclusion</b>
<i>The various requirements in Table 2 are linked to checklist questions the project should meet. The checklist is organised in five different sections. Each section is then further sub-divided. The lowest level constitutes a checklist question.</i>	<i>Gives reference to documents where the answer to the checklist question or item is found.</i>	<i>Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.</i>	<i>The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached.</i>	<i>This is either acceptable based on evidence provided (OK), or a <b>Corrective Action Request (CAR)</b> due to non-compliance with the checklist question (See below). <b>Clarification Request (CL)</b> is used when the validation team has identified a need for further clarification.</i>

<b>Validation Protocol Table 3: Resolution of Corrective Action and Clarification Requests</b>			
<b>Draft report clarifications and corrective action requests</b>	<b>Ref. to checklist question in table 2</b>	<b>Summary of project owner response</b>	<b>Validation conclusion</b>
<i>If the conclusions from the draft Validation are either a Corrective Action Request or a Clarification Request, these should be listed in this section.</i>	<i>Reference to the checklist question number in Table 2 where the Corrective Action Request or Clarification Request is explained.</i>	<i>The responses given by the Client or other project participants during the communications with the validation team should be summarised in this section.</i>	<i>This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".</i>

**Figure 1 Validation Protocol Tables**

## 2.1 Desk review of the Documents

The Project Design Document (PDD) version 09 was submitted July. 2008 and reviewed with additional background documents related to the project design including baseline and additionality of the project. A complete list of all documents and proofs reviewed is in section 6, Reference, to this report.

Furthermore,



Main changes between the versions published for the 30 days stakeholders commenting period and the final version submitted for registration:

- Changes related to the CARs and CLs identified in the KFQ's validation report
- Change of Starting date of the Crediting period considering 4 weeks before requesting for registration

## 2.2 Follow-up Interviews with Project Stakeholders

Issues identified by KFQ during the subsequent stages of the validation have been clarified through continuous communication with the project participants. The project participants have also provided underlying documentation for review by KFQ, confirming selected information and resolving issues identified in the validation

In the period of 30 October 2008 to 31 Oct 2008 and 21 November 2008, KFQ performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. The main topics of the interviews are summarized in Table 1.

**Table 1 Interview topics**

Interviewed organisation	Interview topics
LG Chem,Ltd - Jae O YOUK - Kee Young SEO - Sung Hee WON - Young Joo Ko	➤ Project design ➤ Project technology, operation, maintenance ➤ Sustainable development issues ➤ Additionality ➤ Environmental impacts(incl. EIA approval) ➤ Stakeholder consultation process ➤ Monitoring plan
Mitsubishi UFJ Securities Co.,Ltd - Soon Chan Hong	➤ Applicability of selected methodology ➤ Baseline determination ➤ Additionality ➤ Emission reductions calculation ➤ Crediting Period ➤ Approval by the host country
Local government - Jae Hong MIN	➤ Environmental issues ➤ Stakeholder comments ➤ Sustainable development issues
Village chief - Bong Suk KANG	➤ Environmental issues ➤ Stakeholder comments ➤ Sustainable development issues

## 2.3 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation is to resolve any outstanding issues which need to be clarified prior to KFQ's positive conclusion on the project design. In order to guarantee the transparency of the validation process, the concerns raised by KFQ and responses provided by project participant are documented in Table 3 of the validation protocol in Appendix A.

For this project, five Corrective Action Requests (CAR) and three requests for Clarification (CL) were identified. These requests were presented to the project participant in a CAR/CL report in 31 Oct. 2008. The additional information provided by the project participant to address these requests and revised PDD of 13 March 2009 resolved the all Corrective Action Request and requests for Clarification to KFQ's entire satisfaction.

## **2.4 Internal Quality Control**

According to KFQ's Procedure for deciding whether to proceed request for registration, the final validation report and validation findings underwent a technical review before being submitted to the project participants for requesting registration of the project activity. 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**

The findings of the validation are stated in the following sections. The validation criteria (requirements), the means of verification and the results from validating the identified criteria are documented in more detail in the validation protocol in Appendix A.

### **3.1 Participation Requirements**

The project participants are LG Chem,Ltd as the project owner from the host Party the Republic of Korea('Korea'), and Mitsubishi UFJ Securities Co.,Ltd, representing the Annex I Party the Japan.

The Letter of Approval (LoA) from Korea was obtained on 20 December 2006. The LoA confirms the project's contribution to sustainable development of Korea.

The Japan confirmed its voluntary participation through a LoA issued on 16 October 2006. This LoA authorizes Mitsubishi UFJ Securities Co.,Ltd as project participant.

According to LoAs of two Parties, thus validation team was able to identify that both Parties meet the requirements to participate in the CDM.

Nevertheless, CAR 1 had to be raised in the course of the validation and was successfully closed (ref Annex: Validation Protocol- Table 3).

## 3.2 Project Design

The project activity is a fuel switch project that involves retrofitting the boilers to allow the use of natural gas instead of bunker fuel oil C.

This process will not increase the lifetime of equipment and the projection capacity. The equipment is expected to last at least 20 more years due to:

- The long lifetime of equipment in the industry as a whole, and the robustness of the equipment design, is a characteristic for most chemical plant. When an investment is made the equipment is thus likely to operate for a long time.
- Strict maintenance procedures, regulated by ISO standards and procedures are in place. As the same reason as for the investment, such maintenance procedures assure long operation range: this is likely to reduce operational interruptions.
- Burner supplier provided a statement which show that lifetime of burner is at lease 20 years as clean fuel, natural gas, is used in the burner which minimizes trouble in the burner, Also in general, boiler and burner can be used permanently under proper maintenance.

Due to the use of a low-carbon fuel such as natural gas, the project shall not only achieve reductions in GHG emissions but also result in the reduction of other air pollutants such as SO<sub>x</sub>, NO<sub>x</sub> and particulate matter.

The starting date of the project has been validated by KFQ as 21 June 2006 which represents the date of purchase order for natural gas burners. KFQ regarded this contract as an official consent to the construction (retrofit)of the project activity and accepted it as the starting date because of project owner was committed to expenditures related to the implementation or related construction of the project activity. Following this contract, retrofitting was started on 30 September 2006 and test run was made in November 2006.

The operational life time of the project is estimated as 20 years and fixed crediting period of 10 year is selected starting on 10 May 2009 or on the date of registration of the CDM project activity whichever is later.

The funding for the project does not lead to a diversion of official development assistance as according to the information obtained by the validation team. Financing of this project activity is planed through the Equity investment from project participant.

Nevertheless, CAR 2 and CAR 3 had to be raised in the course of the validation and were successfully closed (ref Annex: Validation Protocol- Table 3).

### 3.3 Baseline Determination

The 'LG Chem Naju plant fuel switching project' applies indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories Type III-B: Switching fossil fuels (Ver.12).

The category III.B is applicable since the project involves switching of bunker fuel oil C by natural gas on boilers at LG Chem, Ltd. and this project activity does not involve switch fossil fuel in baseline to renewable biomass, bio-fuel or renewable energy in the project scenario. Also annual emission reduction is estimated as 19,635 t CO<sub>2</sub>e, which is less than the 60 k t CO<sub>2</sub>e stipulated as threshold for this project category. Especially for last requirement in above, validation team calculated emission reduction with full capacity of boiler in project scenario and confirmed that emission reduction of this project activity is less than 60 k t CO<sub>2</sub>e.

Validation team checked this project activity meet all above requirement for small-scale project by document such as a record of operation hour and capacity of the boiler and on-site observation.

In the project activity natural gas will be used to generate the thermal energy so methodology III.B version 12 'Switching fossil fuel' is correctly applicable. With reference to the applicable methodology the baseline selected is 'fuel consumption of the technologies that would have been used in the absence of the project activity times an emission coefficient for the fossil fuel displaced'. And emission reductions were calculated by deducting the project emission from the baseline emission.

Historical information on the use of bunker fuel oil C in the baseline captive energy generation plant from 3 years prior to project implementation (1 November 2003 ~ 31 October 2006) is used.

The parameters used for the baseline emission in the PDD section B.6.3 were cross checked. And the values of fuel consumption as used in spread sheet of emission reduction calculations was cross checked with the source values in plant records and found satisfactory. Also NCV of the natural gas has been calculated based on the 'Standard manual for Calorific Value' approved by Ministry of Knowledge Economy/Korea Energy Management Corporation.

As a result,  $EF_{\text{baseline}}$  is calculated as 89.05 t CO<sub>2</sub>/TJ and baseline emissions is calculated as 71,351 t CO<sub>2</sub> based on the historical steam generation by bunker fuel oil C.

Validation team has confirmed that the application, discussion and determination of the chosen baseline methodology are transparent and reasonable. Baseline for this project activity is reasonably determined by validating the key assumption, calculations and rationales used in the PDD by checking the documents and sources referred to in the PDD.

Nevertheless, CL 1 and CAR 5 had to be raised in the course of the validation and were successfully closed (ref Annex: Validation Protocol- Table 3).

### **3.4 Additionality**

The starting date of project activity is 21 June 2006(date of purchase order for natural gas burners) and it is the earliest date of implementation, construction and real action as PP has committed to expenditure related to the implementation or related to the constriction of the project activity.

There are other dates which could be used, as CDM consulting agreement (2006-05-29), which is earlier than purchase order for natural gas burner. However validation team confirmed that 21 June 2006 is more appropriate for starting date, taking into account that no real action could be done in the project without this purchase order, and it therefore marks the beginning of real action of the project activity.

Evidence of CDM consulting agreement and purchase order for natural gas burners was submitted to DOE and validation team concluded that 21 June 2006 is valid among various evidences.

The proofs for the prior consideration of applying for CDM to support project activity have been demonstrated by the project participants and verified by KFQ. In line with the guidance of EB 41 Annex 46 paragraph 5(a), further evidences requested from the project participants were evaluated by KFQ. A summary of these evidences is provided in the following paragraphs.

PP got a CEO approval proceed into fuel switching project activity as a CDM project activity on 14 December 2005 and this decision was made based on the 'Plan of the fuel switching project in Naju plant' on 11 November 2005. In this plan, revenue from this project was analyzed and compared benefits with CDM and without CDM.

All of these activities were evidenced by PP and validation team concluded that delivered evidence shows awareness of the CDM prior to the project activity start date.

To proceed with the application, purchase order for natural gas burner was finalized between LG Chem,Ltd. and Huengkuk Industries who is a Korea branch of main equipment supplier, HAMWORTHY COMBUSTION, on 21 June 2006. And on 30 September 2006, PP started boiler retrofit and test-run in November 2006.

As described in the PDD, this project activity was requested for registration in June 2007 but CDM EB instructed the previous DOE, KEMCO, suspend the validation procedure due to the possible conflict of interest of the DOE with the project activity. Thus request for registration

was withdrawn and validation contract was terminated. Therefore this project activity was re-conducted validation by a new DOE, KFQ.

In conclusion, KFQ confirmed that the project owner was aware of the CDM prior to the starting date of the project, and that the benefits of the CDM were as decisive factor in the decision to proceed with the project activity. Also the project participants have demonstrated through evidences and official documents that the sequence of the events is coherent and reliable under the additionality point of view.

The additionality of the project has been demonstrated by the existence of an investment barrier. The project's financial viability evaluation is based on the NPV. According to the third party report, Asia Pacific Equity Research (29 March 2005), discount rate of 9.9% is applied to net present value analysis and it deemed to be reasonable and appropriate for this project activity. And this rate is available value to use at the time of decision.

The input values used in the investment analysis are taken from the report material that planned on 11 November 2005 by LG Chem,Ltd. which was basic information to make decision of invest this project activity.

KFQ reviewed the input values in:

- GSP PDD and IAR (Investment Analysis Report)
- The 'Switching fuel project plan' that was reported to CEO and investment decision was formally taken based on this report. Also there is approval by CEO to proceed into the fuel switching project activity.

Input vales in these documents are slightly different.

① Investment cost: 800 Million KRW

Investment cost in the document at the decision making, GSP PDD and final PDD are same and validity of this cost is demonstrated through purchase contract signed 21 June 2006. As this cost is actual expenditure related to the implementation of the project activity, KFQ confirmed that this value has a validity and applicable at the time of investment decision.

② O&M Cost

- Baseline Scenario: 655 Million KRW/yr
- Project Scenario: 329 Million KRW/yr

O& M cost of baseline scenario and project scenario in GSP PDD are re-estimated based on historic expenditures as it was overestimated. Thus each expense related to this project activity is demonstrated by evidence such as internal accounting system and receipts of

expense provided by PP. KFQ confirmed that included cost items are acceptable and each expense has validity at the time of decision.

③ Fuel consumption

- Baseline Scenario: 23,576,764 liter/yr
- Project Scenario: 23,046,286 Nm<sup>3</sup>/yr

Fuel consumption of bunker fuel oil C is estimated based on 3 years data prior to the project implementation from 1<sup>st</sup> November 2003 to 31<sup>st</sup> October 2006. Amount of consumption in GSP are slightly smaller than those in final PDD due to condition of steam enthalpy, data unit and etc. were not correctly applied in the baseline situation. Thus validation team examined all the data and assumptions in estimation of fuel consumption and checked metering record of bunker fuel oil C consumption.

④ Fuel Costs:

- Baseline Scenario: 330.81 KRW/liter
- Project Scenario: 399.80 KRW/Nm<sup>3</sup>

PP used average (2003 ~ 2005) fuel price of bunker fuel oil C and natural for investment analysis and price of these fuels are demonstrated by receipt and fuel information provided by KOGAS. During the site visit, several purchase receipts of bunker fuel oil C and natural gas were verified, confirming the prices referred in the PDD and justifying the assumptions made in the NPV analysis. The trends in fuel oil and natural gas consumption in Naju city and the sector were analyzed and KFQ has been able to confirm the appropriateness of the analysis.

⑤ Fuel efficiency for baseline and project scenarios

Fuel efficiency of boiler in each scenario is 91% as previous boiler has been only retrofitted to allow fuel switching from bunker fuel oil C to natural gas. And it is from the nameplate and specification of the boiler and it is used to estimate the expected amount of natural gas consumption in the project scenario.

⑥ Net Calorific Value of fuel

NCV of bunker fuel oil C and natural gas are adopted from the Standard Manual for Calorific Values approved by Ministry of Knowledge Economy/Korea Energy Management Corporation. As these approved data is reliable national data, KFQ confirmed that used NCV are applicable to this project activity.

The validation team has checked all sources of the NPV calculation, as presented in B.5 in the PDD. Furthermore the calculation spreadsheet was checked and the consistency of the used figures with the same stated in the PDD verified.

KFQ therefore, is able to confirm that the input values in PP's evaluation are valid and appropriate representing the economic situation of the project at the time of investment decision.

A sensitivity analysis has been carried out for parameter contributing more than 20% to revenues or costs. Reasonable variations of the initial equipment cost, O&M cost, fuel price of natural price and discount rate were checked to confirm whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. It deems reasonable to use the applied method and substantial variation of these parameters have been moreover considered unlikely to occur:

- 1) Initial equipment: As this project activity is under operation, it is hardly to increase initial equipment cost as it is already had been paid.
- 2) O& M Cost: The difference in O&M costs reflects the parasitic fuel consumption for bunker fuel oil C heating, electricity consumption for pumps, maintenance costs and after-treatment costs. Among those, electricity consumption is the most main factor in O&M cost and O&M cost for baseline scenario is calculated based on actual 2005 historical data. And O& M cost for project scenario is estimated by deducting electricity consumption of pumps and scrubbers as these are not installed in project scenario. Also electricity price is continuously increased every year thus, it is unlikely to decrease electricity price in O&M Cost. Thus KFQ concluded that variation range of -10% to O&M Cost is enough variation range for sensitivity analysis.
- 3) Natural gas price: KFQ checked that the range of fluctuation in natural gas price is within +/- 10% in past 3 years and distribution of natural gas price of each year is also less than +10%. Thus decreasing natural gas price is unlikely to occur.

As described above, NPV of total cost for project scenario is always higher than that of baseline scenario, confirming the robustness of economical attractiveness of baseline scenario.

Information provided as above, KFQ concluded that it is deemed demonstrated that the project is not a likely baseline scenario and emission reductions occurring from the project can thus be considered additional. Even with the expected amount additional income from CERs sales, the project activity is still economically unattractive.

Nevertheless, CAR 4 and CL 3 had to be raised in the course of the validation and were successfully closed (ref Annex: Validation Protocol- Table 3).



### **3.5 Monitoring Plan**

The project activity correctly applied the indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories Type III.B-Switching fossil fuels.

The monitoring methodology considers monitoring emission reductions generated from switching from bunker fuel oil C combustion to natural gas at the LG Chem Ltd. The monitoring plan for emission reductions occurring within the project boundary are based on measuring the natural gas consumption through individual meter identified in PDD. And monitored natural gas consumption will be double checked with the receipt of purchase for assure its objectivity.

The meter to monitor quantity of natural gas combusted in the project boiler will be calibrated periodically by 3<sup>rd</sup> party, natural gas provider(Hae Yang City Gas). Details of the data to be collected, the frequency of data recording, and its certainty are described. Algorithms and formulae used have also been clearly established. The recording frequency of the data is appropriate for the project.

LG Chem Ltd. is responsible for the project management monitoring and reporting of emission reductions as well as for organising and training of the staff in the appropriate monitoring, measurement and reporting techniques.

KFQ validated the monitoring plan of this project through interviewing project stakeholders. We confirmed that this monitoring plan is in accordance with AMS-III.B that all monitoring parameters for the project is contained in the monitoring plan and that the monitoring arrangements described in the PDD can be properly implemented.

Nevertheless, CL 2 had to be raised in the course of the validation and was successfully closed (ref Annex: Validation Protocol- Table 3).

### **3.6 Calculation of GHG Emissions**

The GHG emissions considered are:

- carbon dioxide emissions from combustion of natural gas (project activity) and bunker fuel oil C (baseline)

The estimates of future fuel consumption are used for the ex-ante determination of expected project and baseline emissions based on steam generation during 3 years(November 2003 ~ October 2006) prior to implementation. However, actual reductions by project are dependent on the actual natural gas consumption. Validation team identified that ex-ante estimates made are

deemed appropriate and confirmed calculation of emission reduction is correct and transparent to this project.

The 19,635 ton CO<sub>2</sub> with annual estimation of 196,350 ton CO<sub>2</sub> is estimated as emission reduction over the fixed crediting period of emission reduction.

### **3.7 Environmental Impacts**

Under the 'Enforcement Decree of the Act on Assessment of Impacts of Works on Environment, Traffic, Disasters', the proposed project activity does not require the completion of an EIA.

In actual fact, natural gas has not contain sulphur, it is expected that SO<sub>x</sub> emissions will be reduced comparing to the baseline scenario. It is also expected that emissions of NO<sub>x</sub> will be reduced by project activity. Thus this project activity will contribute to improve local air quality.

### **3.8 Comments by Local Stakeholders**

PP invited local stakeholders to receive their comment on 28 July 2006. Also consultation was carried out via newspaper.

Evidence of above consultation process were identified through the documents and interviewing local stakeholders. KFQ founded that there were 2 comments from local stakeholders which were no negative comments in regards to the project activity.

Validation team confirmed that all relevant local stakeholders have been invited to consultation via appropriate media, the summary of comments received as provided in the PDD are appropriate, and due accounts was taken properly and described in the PDD well.

## **4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS**

Korean Foundation for Quality published the project documents on <http://cdm.unfccc.int/Projects/Validation> on 29 July 2008 and invited comments within 27 August 2008 by Parties, stakeholders and non-governmental organisations. No comment was received.

## 5 VALIDATION OPINION

*Korean Foundation for Quality (KFQ) has performed a validation of the 'LG Chem Naju plant fuel switching project' in Republic of Korea ('Korea'). The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism and host country criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and subsequent decision by the CDM Executive Board.*

*The validation is based on the information made available to us and the engagement conditions detailed in this report. The only purpose of this report is its use during the registration process as part of the CDM project cycle. Hence, KFQ can not be held liable by any party for decisions made or not made based on the validation opinion, which will go beyond that purpose. And it has provided KFQ with sufficient evidence to determine the fulfillment of stated criteria. The validation consisted of the following 3 phases : i) a desk review of the project design, the baseline and monitoring plan, ii) follow-up interviews with project stakeholders and iii) the Resolution of outstanding issues and the issuance of the final validation report and opinion.*

*The host country is the Republic of Korea and the Annex I country is the Japan. Both countries fulfill the participation criteria and have approved the project and authorized the project participants. The Korea DNA confirmed that the project assists in achieving sustainable development.*

*The validation did not reveal any information that indicated that the project can be seen as a diversion of official development assistance (ODA) funding towards China.*

*The baseline scenario assumes that fuel oil would continue to be used during the crediting period. Emission reductions will thus be achieved through the use of natural gas, a fuel with a carbon emission factor that is lower than the carbon emission factor of the previously used bunker fuel oil C.*

*We can confirm that the indicated amount of emission reductions of 196,350 ton CO<sub>2</sub> over 10 years fixed crediting period, resulting in a calculated annual average of 19,635 ton CO<sub>2</sub>, represents a reasonable estimation using the assumptions given by the project documents.*

*The project applied the indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories Type III-B-Switching fossil fuels version 12. The baseline methodology has been applied correctly and the assumptions made for the selected baseline scenario are sound. It is sufficiently demonstrated that the project is not a likely baseline scenario and that emission reductions attributable to the project are additional to any that would occur in the absence of the project activity.*

*The project application of the methodology is correct and the determination of the baseline is transparent and ex-ante emission factors are applied. Appropriate estimates on future fuel consumption are used for the ex-ante determination of expected project and baseline emissions.*

*In our opinion, the 'LG Chem Naju plant fuel switching project' as described in the revised PDD of 12 March 2009(version 10.3), meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the baseline and monitoring methodology AMS-III. B\_Version 12. Thus the 'LG Chem Naju plant fuel switching project' will hence be recommended by KFQ for requesting for registration as a CDM project to UNFCCC.*

## 6 REFERENCES

Reference No.	Documentation and/or website	Remarks
1	Project Design Document for CDM project ‘ LG Chem Naju plant fuel switching project - Version 9.0: 16 July 2008 - Version 10.3: 13 March 2009	
2	Supporting Excel Spreadsheet on Financial Analysis Report, Mitsubishi UFJ Securities Co.,Ltd - Version 01: 16 July 2008 - Version 03: 13 March 2009	
3	AMS-III.B: Switching fossil fuels (Ver. 12) Methodological Tool: Tool for the demonstration and assessment of additionalilty (Ver. 05) Annex 35, Guidance on the Assessment of Investment Analysis 2006 IPCC Guidelines for National Greenhouse Gas Inventories Clean development mechanism validation and verification manual (ver 01): UNFCCC	
4	Annex I country DNA Approval: 16 October 2006 Host country DNA Approval: 20 December 2006	
5	Standard manual for Calorific value: 4 September 2006, KEMCO	
6	CEO approval for CDM application and project financing: 14 December 2005, LC Chem.,Ltd	
7	Asia Pacific Equity Research: 29 March 2005, JPMorgan	
8	Study of baseline methodology for fuel switching to natural gas: March 2005, KEMCO	
9	Statement for lifetime of boiler: Heungkuk Industries	
10	Electricity and bunker fuel oil C consumption: LG Chem.,Ltd	
11	Invoice bunker fuel oil C and electricity: LG Chem.,Ltd,	

12	Price of natural gas provided by KOGAS (Korea Gas Corporation)	
13	Steam table: Spirax Sarco, <a href="http://www.spiraxsarco.com/resources/steam-tables.asp">http://www.spiraxsarco.com/resources/steam-tables.asp</a>	
14	Documents for burner system (as-built):05 December 2006, Heungkuk Industries	
15	Record of operating hours: LG Chem,Ltd	
16	Burner/Boiler specification, HAMWORTHY	
17	Sample of training record: 19 November 2006, LG Cehm.,Ltd	
18	Agreement of consulting services between Mitsubishi UJF Securities Co.,Ltd. and LG Chem,Ltd.: 29 May 2006	
19	Purchase contract for natural gas burners: 21 June 2006, LG Chem,Ltd and Heungkuk Industries	
20	‘Switching fuel project plan’: 11 November 2005, LG Chem,Ltd.	
21	Meeting material for stakeholder consultation: 28 July 2006, LG Chem,Ltd.	
22	Meeting minutes for stakeholder consultation: 28 July 2006, LG Chem,Ltd.	

## Appendix A

### Validation protocol for Small-Scale CDM project activities

**Table 1. Mandatory Requirements for Small-Scale Clean Development Mechanism(CDM) Project Activity**

Requirement	Reference	Conclusion	Cross Reference / Comment
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3	Kyoto Protocol Art. 12. 2	OK	Table 2, B.6
2. The project shall assist non-Annex 1 Parties in contributing to the ultimate objective of UNFCCC.	Kyoto Protocol Art. 12. 2	OK	Table 2, B.6
3. The project shall have written approval of voluntary participation from the designated national authorities of each party involved.	Kyoto Protocol Art. 12.5a/ CDM Modalities and Procedures §40a	<del>NO</del> OK	Table2, A.3.3.  <del>LoA of Korea and Japan have been submitted to DOE. As this project was re-validated, current status of project activity should be noticed to Korea DNA and result of it should be provided to DOE.</del>  Yes. According to Korea DNA's rule, status of this project activity is noticed to the Korea DNA.
4. The emission reductions shall be real, measurable and give long-term benefits to the mitigation of climate change.	Kyoto Protocol Art. 12.5b	OK	Table 2, B.6.
5. Reduction in GHG emissions shall be additional to any that would occur in absence of the project activity.	Kyoto Protocol Art. 12.5c/ CDM Modalities and Procedures §26	OK	Table 2, B.4.
6. The proposed project activity shall meet the eligibility criteria for small scale CDM project activities set out in § 6 (c) of the Marrakech Accords and shall not be a debundled component of a larger project activity.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §12a,c	OK	Table 2, A.4.6.  Project meets eligibility criteria for SSC project of Type III: Below 60Kt CO2e annually. And there is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity in the small project category and technology within 1 km of the project boundary.



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7. The proposed project activity shall confirm to one of the project categories defined for small scale CDM project activities and use the simplified baseline and monitoring methodology for that project category.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22e	OK	Table 2, A.4.2 and B. The proposed project belongs to the category of III.B, Other project activity_switching fossil fuels.
8. If required by the host country, an analysis of the environmental impacts of the project activity is carried out and documented.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22c	OK	Table 2, Section D
9. In case public funding from Parties included in Annex I is used for the project activity, these Parties shall provide an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties.	Decision 17/CP.7, CDM Modalities and Procedures Appendix B, § 2	OK	Table 2, Section A.4.5. The validation did not reveal any information that indicates that the project can be seen as a diversion of official development assistance (ODA) funding towards Korea.
10. Parties participating in the CDM shall be designated a national authority for the CDM.	CDM M&P 29	OK	The office for government policy coordination is DNA in Korea for CDM. And the DNA of Japan is Liaison Committee for the Utilization of the Kyoto Mechanism Ministry of Foreign Affairs.
11. The host party and the participating Annex I party shall be a Party to the Kyoto Protocol.	CDM M&P 30/31b	OK	Host party, Republic of Korea has ratified the Kyoto Protocol on 8 November 2002. Annex I party, Japan, ratified the Kyoto Protocol on 04 June 2002.
12. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM M&P 31b	OK	For Japan's assigned amount is 94% of the emission level in 1990.
13. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7.	CDM M&P 31b	OK	The validation has not in detail assessed Japan compliance with article 5 and 7 of the Kyoto Protocol. The Japan has in place a national system for estimating GHG emissions and annually submits in most recent inventory to the UNFCCC.
14. Comments by local stakeholders are invited, a summary of these provided and how due account was taken of any comments received.	CDM M&P 37b	OK	Table 2, Section E

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15. Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, shall be submitted, and, if those impacts and considered significant by the project participants of the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out.	CDM M&P 37c	OK	Table 2, Section D.
16. Baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM M&P 37e	OK	Table 2, Section B.1.1 and B.7.1
17. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP.	CDM M&P 37f	OK	Table 2, Section B.7
18. Parties, stakeholders and UNFCCC accredited NGOs shall have been invited to comment on the validation requirements for minimum 30 day, and the project design documents and comments have been made publicly available.	CDM M&P 40	OK	They were invited to provide comments through the CDM website during 30 days from 29 July 2008 to 27 August 2008. No Comment was received during the period.
19. A baseline shall be established in a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances.	CDM M&P 45c,d	OK	Table 2, Section B.5
20. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity of due to force majeure.	CDM M&P 47	OK	Table 2, Section B.5.
21. The project design document shall be in conformance with the UNFCCC CDM-PDD format.	CDM M&P Appendix B, EB Decision	OK	CDM-PDD is in conformance with the UNFCCC CDM-PDD format version 03.

**Table 2. Requirements Checklist**

MoV =Means of Verification, DR=Document Review, I=Interview

Question	Ref.	MoV	Comments	Draft. Concl.	Final Concl.
<b>A. General Description of Project Activity</b>					
<b>A.1 Project Title</b>					
A.1.1 Does the used project title clearly enables to identify the unique CDM activity?	PDD A.1	DR,I	Yes. The project title is “LG Chem Naju plant fuel switching project”. The project titled with the name of the project location and the energy source of the project. Hence, it can be clearly identified.	<b>OK</b>	<b>OK</b>
A.1.2 Are there any indication concerning the revision number and the date of the revision?	PDD A.1	DR	Yes. The available PDD for document review and on-site assessment is indicated as version 10.1 and has been completed on 16. December.2008	<b>OK</b>	<b>OK</b>
<b>A.2 Description of the small-scale project activity</b>					
A.2 1 Is the description delivering a transparent overview of the project activities?	PDD A.2,	DR, I	Yes. The description is delivering a transparent overview of the project activity. The project activity involves fuel switching project from bunker fuel oil C to natural gas. On average over the past 3 years, PP has used approximately 23,500 kilolitres of bunker fuel oil C annually for steam generation at Naju plant. For fuel switching from bunker fuel oil C to natural gas, four natural gas burners have been installed for the main boiler. Total capacity of four natural gas burners installed is 5,353 Nm <sup>3</sup> , which is of sufficient capacity for the expected amount of natural gas consumption at Naju plant.	<b>OK</b>	<b>OK</b>
A.2 2 What proofs are available demonstrating that the project description is in compliance with the actual situation or planning?	PDD Sec.A /B	DR, I	During the on-site assessment, numerous proofs for the described project activity were evidenced. They are summarized in the reference list, Annex A to this report.  - Equipment purchase contract - Site layouts	<b>OK</b>	<b>OK</b>

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			<ul style="list-style-type: none"> <li>- Data records on historical consumption of Bunker Oil C</li> <li>- Data records on historical generation of steam</li> <li>- Technical specification for burner and boiler, etc</li> </ul> <p>These data have been evidenced during validation work. The required data are delivered in the PDD.</p>		
A.2 3 Is all information presented consistent with details provided by further chapters of the PDD?	PDD	DR	The information given in the PDD is all consistent in further chapters. .	<b>OK</b>	<b>OK</b>
A.2 4 Does the description of the technology to be applied provide sufficient and transparent input to evaluate its impact on the greenhouse gas balance?	PDD A.4.3	DR, I	<p>Yes, the project would avoid GHG emissions by installation of burner and boilers using natural gas which is cleaner than Bunker Oil C to generate steam.</p> <p>Purge gas and by-product liquid fuel will continue to be combusted in the existing boiler without any change, only bunker fuel oil C is switched to natural gas.</p> <p>Therefore, natural gas consumption for steam generation will be used to calculate emission reduction by this project activity.</p>	<b>OK</b>	<b>OK</b>
A.2 5 Is the brief explanation how the project will reduce greenhouse gas emission transparent and suitable?	PDD A.4.3	DR	The explanation of how the project activity will reduce greenhouse gas emissions is suitable.	<b>OK</b>	<b>OK</b>
A.2 6 Will the project create other environmental or social benefits than GHG emission reductions?	PDD A.2	DR, I	The natural gas has no sulphur contend compared with bunker oil C, so no NOx is emitted to atmosphere.	<b>OK</b>	<b>OK</b>
A.2 7 Has the host country confirmed that the project assists it in achieving sustainable development?	PDD A.2	DR, I	<p>By using an environmentally friendlier fuel, the project will contribute to the sustainable development of Korea in the following ways:</p> <ul style="list-style-type: none"> <li>- mitigation of GHGs</li> <li>- transfer of new technology</li> <li>- improvement of environmental condition</li> <li>- promotion of clean energy usage in the local area</li> </ul> <p>The DNA of Korea confirmed that the project assists in achieving sustainable development.</p>	<b>OK</b>	<b>OK</b>
<b>A.3 Participation requirements</b>					

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A.3.1 Is the table required for the indication of project participants correctly applied?	PDD A.3	DR	The form is correctly applied. The following parties are involved on the project activity: - Host Party, Republic of Korea : LG Chem, Ltd - Annex I Party, Japan : Mitsubishi UFJ Securities Co., Ltd	<b>OK</b>	<b>OK</b>
A.3.2 Is all information in participants/ Parties provided in consistency with details provided by further chapters of the PDD (in particular Annex I)?	PDD A.3, Anne x I	DR, I	Yes, the information provided is in consistency with further chapters of the PDD, the party listed in host party is identical with those listed under A.3.	<b>OK</b>	<b>OK</b>
A.3.3 Have all involved Parties provided a valid and complete letter of approval and have all private/public project participants been authorized by and involved party?	PDD A.3	DR, I	LoA of Korea and Japan have been submitted to DOE. As this project was re-validated, current status of project activity should be noticed to Korea DNA and result of it should be provided to DOE.	<b>CAR 1</b>	<b>OK</b>
<b>A.4. Technological description of the small-scale project activity</b>					
<b>A.4.1 Location of the small-scale the project activity</b>					
A.4.1.1 Does the information (geographical) provided on the location of the project activity allow for a clear identification of the site?	PDD A.4	DR	The geographical location of the project activity has been clearly defined in the PDD.  The project is located at located at 1, Songwal-dong, Naju, Jeollanam-do, 520-130, Korea. It is located in the Naju city and about 20 km southwest from Gwangju International Airport.	<b>OK</b>	<b>OK</b>
A.4.1.2 How is it ensured and/or demonstrated, that the project proponents can implement the project at this site (Ownership, Licenses, Contracts etc.)?	PDD A.4	DR, I	Implementation of this project activity is within LG Chem's Naju plant and is demonstrated through Business license.  Furthermore, this project activity is under installation since 2006.	<b>OK</b>	<b>OK</b>
<b>A.4.2 Category(ies) of project activity</b>					
A.4.2.1. To which type(s) does the project activity belong to? Is the type correctly identified and indicated?	PDD A.4.2	DR	The project activity belongs to Type III, Other project activity and the type has been correctly identified and indicated in the PDD.	<b>OK</b>	<b>OK</b>

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A.4.2.2. To which category (ies) does the project activity belong to? Is the category correctly identified and indicated?	PDD B.2	DR	<p>The chosen baseline methodology refers to category III. B ‘Switching fossil fuels’ according to Appendix B of Annex II ‘Simplified modalities and procedures for small-scale CDM project activities’.</p> <p>Proposed project activity meets following applicability criteria:</p> <ul style="list-style-type: none"> <li>- Fossil fuel switching in existing industrial: YES</li> <li>- Not switch fossil fuel in the baseline to renewable biomass, biofuel or renewable energy in the project scenario: YES</li> <li>- Emission reduction of less than or equal to 60 ktCO2 equivalent annually: YES</li> </ul> <p>Thus, baseline and monitoring methodology is the most applicable for this project among the existing approved baseline methodologies.</p>	OK	OK
<b>A.4.3 Technology to be employed by the small-scale project activity</b>					
A.4.3.1 Does the project design engineering reflect current good practices?	PDD A.4.2	DR, I	<p>The project activity involves fuel switching from bunker fuel oil C to natural gas without boiler exchange.</p> <p>Total capacity of four natural gas burners installed is 5,353 Nm3/hr, which is of sufficient capacity for the expected amount of natural gas consumption at Naju plant. The natural gas burners are provided by HAMWORTHY COMBUSTION, which is one of the world’s largest combustion equipment manufacturers, with the experiences of equipment installation in over 100 countries. Specification of the boiler and burner are crosschecked with specification provided by HAMWORTHY COMBUSTION and currently installed boiler and burners at the site.</p> <p>According to specification of boiler, boiler efficiency of project scenario is same as baseline scenario because of boiler is being used as usual, but it was stated as more than 91% in the PDD version 10.1. Thus correct information should be provided in the PDD.</p>	CL 1	OK
A.4.3.2. Does the implementation of the project activity require any technology transfer from Annex-I-countries to the host country (ies)?	PDD A.4.2	DR, I	Yes. Please refer A.4.3.1 of this protocol.	OK	OK

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A.4.3.3. Is the technology implemented by the project activity environmentally safe?	PDD A.2	DR, I	Yes, The Project activity will reduce emissions of SOx and NOx. Under current regulations, bunker fuel oil C (Sulphur 0.5%) can be used as an industrial fuel in the Naju area. Therefore, by switching fuel from bunker fuel oil C to natural gas, which does not contain sulphur, it is expected that emissions of SOx will be reduced by more than 90%. It is also expected that emissions of NOx will be reduced.	<b>OK</b>	<b>OK</b>
A.4.3.4. Is the information provided in compliance with actual situation or planning?	PDD A.4.2	DR, I	Yes. This project is under installation. Pls. kindly refer A.2.2.	<b>CL</b>	<b>OK</b>
A.4.3.5 Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies in the host country?	PDD A.4.2	DR, I	Yes. In the absence of the Project activity, LG Chem would be utilizing bunker fuel oil C for steam generation, which is the current situation. Under the current regulations, it is allowed to use bunker fuel oil C at Naju area and there are no regulations that requires the use of natural gas or any other fuel.  Therefore, the common practice for steam generation is still bunker C-used. Hence, the project definitely would result in a better performance than the common practice.	<b>OK</b>	<b>OK</b>
A.4.3.6. Is the project technology likely to be substituted by other or more efficient technologies within the project period?	PDD A.4.2	DR,I	Yes. Lifetime of this proposed project activity as mentioned in the PDD is 20 years, but it was not demonstrated during on-site assessment.  Please kindly provide evidence that shows lifetime of project activity is 20 years and project technology would not be substituted during the crediting period.	<b>CAR 2</b>	<b>OK</b>
A.4.3.7. Does the project require extensive training and maintenance efforts in order to work as presumed during project period?	PDD A.2	DR, I	Before start of project activity, the operators have received education from the domestic agent of the burner manufacturer, Heungkuk Industries Co.,Ltd, for proper operation of the boiler in 19 November 2006.  Also procedure for training and maintenance of equipments were shown during on-site assessment. However this was not stated in the PDD, and please submits evidence of this training.	<b>CL 2</b>	<b>OK</b>
A.4.3.8 Does the project make provisions for meeting training and maintenance needs?	PDD B.7.2	I	Yes. Refer A.4.3.7	<b>CL 2</b>	<b>OK</b>
<b>A.4.4 Estimated amount of emission reductions over the chosen crediting period</b>					

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A.4.4.1 Is the table required for the indication of projected emission reductions correctly applied?	PDD A.4.3	DR, I	Yes. The project emission reductions are shown in chapter A.4.3 Table 2 according to the guidelines.	<b>OK</b>	<b>OK</b>
A.4.4.2 Are the figures provided consistent with other data presented in the PDD?	PDD	DR	Yes. The yearly emission reduction is estimated to be 19,635 t CO <sub>2</sub> which is the result of emission factor of the times the annual electricity fed to the grid. The same figure is quoted in the entire PDD.	<b>OK</b>	<b>OK</b>
<b>A.4.5 Public funding of the project activity</b>					
A.5.5.1 Does the information on public funding provided conform with the actual situation or planning as presented by the project participants?	PDD A.4.4	DR, I	The PDD mentioned that no ODA was used for the project activity. Investment for the project activity is from Equity: 100%. This is evidenced through approval of BOD of the LG chem., Ltd, and it was approved on 14 December 2005.	<b>OK</b>	<b>OK</b>
<b>A.4.6 Confirmation that the small-scale project activity is not a de-bundled component of a large scale project activity</b>					
A.4.6.1 Is there a registered small-scale CDM project activity or an application to register another small-scale CDM project activity: with the following characteristics:	PDD A.4.5	DR,I	The following criteria were checked to confirm that the proposed project activity is not a de-bundled component of a large scale project activity. <ul style="list-style-type: none"> <li>- The same project participants? : No</li> <li>- In the same project category and technology/measure? : No</li> <li>- Registered within previous two years? Or in registration process? : No</li> <li>- Whose boundary is within 1 km of the project boundary of the small scale project activity under consideration? : No</li> </ul>	<b>OK</b>	<b>OK</b>
A.4.6.2 If the answer to all the above question is 'Yes' then does the total size of the small scale project activity combined with previously registered small scale CDM project activity exceeds the limits of small scale CDM project activities?	PDD A.4.5	DR,I	No applicable. The proposed project is not a de-bundled component of a larger project activity.	<b>OK</b>	<b>OK</b>
<b>B. Application of a baseline and monitoring methodology</b>					
<b>B.1 Title and reference of the approved baseline and monitoring methodology applied to the project activity</b>					



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B.1.1 Are reference number, version number, and title of the baseline and monitoring methodology clearly indicated?	PDD B.1	DR	Yes. As clearly indicated the applied methodology is AMS Type III-Switching fossil fuels (version 12).	OK	OK
B.1.2 Is the applied version the most recent one and/or is this version still applicable?	PDD B.1	DR	The 12 <sup>nd</sup> version of AMA-III.B is the latest one where the PDD was prepared and published for the GSP.	OK	OK
<b>B.2 Justification of the choice of the project category</b>					
B.2.1 Is the applied methodology considered the most appropriate one?	PDD B.2	DR	<p>Yes. The chosen baseline methodology refers to category III. B ‘Switching fossil fuels’ according to Appendix B of Annex II ‘Simplified modalities and procedures for small-scale CDM project activities’.</p> <p>Proposed project activity meets following applicability criteria:</p> <ul style="list-style-type: none"> <li>- Fossil fuel switching in existing industrial: YES</li> <li>- Switch fossil fuel in the baseline to renewable biomass, biofuel or renewable energy in the project scenario: NO</li> <li>- Emission reduction of less than or equal to 60 ktCO<sub>2</sub> equivalent annually: YES. Boiler is installed most of time except shut down (approximately 15 hours in a year) this it is unlikely to have emission reduction more to 60 kt CO<sub>2</sub> equivalent annually.</li> </ul> <p>Thus, baseline and monitoring methodology is the most applicable for this project among the existing approved baseline methodologies.</p>	OK	OK
B.2.2 Are the applicability criteria in the baseline methodology all fulfilled and described in the PDD?	PDD B.2	DR	Refer B.2.1.	OK	OK
<b>B.3 Description of the sources and gases included in the project boundary</b>					
B.3.1 Does the project boundary include physical, geographical site of the industrial facility, processes or equipment that are affected by the project activity??	PDD B.3	DR, I	<p>Yes, the spatial and technological boundaries as verified onsite comply with the discussion provided by the PDD.</p> <p>As per the baseline methodology, the project boundary is the physical, geographical site where the fuel combustion affected by the fuel switching measure occurs. Therefore the project boundary encompasses the boiler in the Naju plant that the fuel switching occurs.</p>	OK	OK

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B.3.2 Do the spatial and technological boundaries as verified on-site comply with the discussion provided by the PDD?	PDD B.3	DR, I	Refer B.3.1	OK	OK
<b>B.4 Description of how the baseline scenario is identified and description of the identified baseline scenario</b>					
B.4.1 What is the baseline scenario? Has the baseline scenario been determined according to the methodology?	PDD B.4	DR, I	The emission baseline is the current emissions of the facility. In the absence of Project activity, LG Chem, Ltd. would be utilizing bunker fuel oil C for steam generation, which is the current situation. This, the baseline scenario assumes that Naju Plant will continue the current practice of using Bucker Oil C for production of steam in the future.	OK	OK
B.4.2 What other alternatives scenario have been considered and why is the selected scenario the most likely one?	PDD B.4/ B.5	DR,I	Yes. The existing boiler has been retrofitted for this project activity without any specification such as capacity, efficiency and etc. changes. As a result of the Project activity, the capacity of the boiler and the remaining lifetime of the boiler are not changed.  Also, the existing boilers have also combusted purge gas and by-product liquid fuel generated from the processes. However, the combustion of such by-products is not be affected by the Project activity, since only bunker fuel oil C is switched to natural gas. Thus, project scenario would be same and only bunker fuel oil C is switched to natural gas.	OK	OK
<b>B.5 Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):</b>					
B.5.1 If the starting date of the project activity is before the date of validation, is evidence available to prove that incentive from the CDM was seriously considered in the decision to proceed with the project activity?	PDD B.5	DR, I	Starting date of the project activity is 21 June 2006 which is date of purchase order for natural gas burners and is the earliest date among implementation, construction and real action. But provide main equipment purchase contract document to assess which date is earliest date of implementation, construction and real action.  According to the CDM glossary, evidence to support awareness of the CDM prior to the project activity start date should include minutes and/or notes related to the consideration of the decision by the Board of Directors, or equivalent, of the project participant, to undertake the project as a proposed	CAR 3	OK

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			CDM project activity. Please provide documented evidence to support awareness of the CDM consideration before 21 June 2006.  Also provide main equipment purchase contract document to assess which date is earliest date of implementation, construction and real action.																	
B.5.2 Is a complete list of barriers developed that prevents the project activity to occur?	PDD B.5	DR, I	Yes. The investment barrier is identified.	OK	OK															
B.5.3 Does this list include at least one of the following barriers?	PDD B.5	DR, I	<table border="1"> <thead> <tr> <th>Barrier</th> <th>Discussed?</th> <th>Verifiable?</th> </tr> </thead> <tbody> <tr> <td>Investment</td> <td>Yes</td> <td>Yes</td> </tr> <tr> <td>Technical</td> <td>No</td> <td>N/A</td> </tr> <tr> <td>Due to prevailing practice</td> <td>No</td> <td>N/A</td> </tr> <tr> <td>Other</td> <td>No</td> <td>N/A</td> </tr> </tbody> </table>	Barrier	Discussed?	Verifiable?	Investment	Yes	Yes	Technical	No	N/A	Due to prevailing practice	No	N/A	Other	No	N/A	OK	OK
Barrier	Discussed?	Verifiable?																		
Investment	Yes	Yes																		
Technical	No	N/A																		
Due to prevailing practice	No	N/A																		
Other	No	N/A																		
B.5.4 Does the discussions sufficiently take into account relevant national and/or sectoral policies?	PDD B.5	DR, I	Yes. Under the current regulations, it is allowed to use bunker fuel oil C at Naju area and there are no regulations that requires the use of natural gas or any other fuel. It is well described in the PDD and validation team confirmed that this project activity is satisfied all the related regulations in Korea.	OK	OK															
B.5.5 Is transparent and documented evidence provided on the existence and significance of these barriers?	PDD B.5	DR, I	<p>Project additionality has been assessed by analyzing the investment barrier.</p> <p>Since the price of natural gas is higher than that of bunker fuel oil C in Korea, fuel switching from bunker fuel oil C to natural gas requires significant amount of additional fuel costs. As described in the PDD, NPV of the total cost for project scenario is higher than that of baseline scenario, which means that the Project activity is not economically attractive. However following were identified to clarify:</p> <ul style="list-style-type: none"> <li>- O&amp;M includes fuel consumption for bunker fuel oil C heating, imported electricity cost for pumps, maintenance costs and after-treatment cost, but validity of each cost item were not demonstrated. And investment analysis should reflect the economic decision making context at point of decision to recommence the project</li> <li>- Amount of fuel consumption and cost of bunker fuel oil C and natural gas shall be demonstrated.</li> <li>- Justification of selected parameters and variation range for sensitivity analysis was not provided.</li> </ul>	CAR 4	OK															

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B.5.6 Is it appropriately explained how the approval of the project activity will help to overcome the identified barriers?	PDD B.5	DR, I	The project activity has negative NPV without CDM revenues and it is still economically unattractive.	<b>OK</b>	<b>OK</b>
B.5.7 Is the analysis presented in a transparent manner including publicly available proofs for the utilized data? And all assumptions applied in a conservative manner?	PDD B.5	DR, I	Evidence of every references and input values on investment analysis should be submitted. Refer B.5.5.	<b>CAR 4</b>	<b>OK</b>
<b>B.6 Emission Reductions</b>					
<b>B.6.1. Explanation of methodological choices</b>					
B.6.1.1. Is it explained how the procedures provided in the methodology are applied by the proposed project activity?	PDD. B.6.1	DR	<p>The calculation of the emission reduction is applied according to the steps described in AMS III.B.</p> <p>The ex-ante approach is chosen for the calculation of the emission factor. Since the accurate and reliable national data is not available, default value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories is used for CO<sub>2</sub> emission factor of natural gas(56.1 t CO<sub>2</sub>/TJ) and bunker fuel oil C (77.4 t CO<sub>2</sub>/TJ).</p> <p>However, Calculation method of baseline emission and project emission is based on using energy of the boiler if fired with natural gas. According to methodology applied, actual amount of energy consumption shall be used in emission reduction calculation as boiler efficiency will not be changed over crediting period.</p>	<b>CAR 5</b>	<b>OK</b>
B.6.1.2. Is every selection of options offered by the methodology correctly justified and is this justification in line with the situation verified on-site?	PDD. B.6.1	DR	There is no option offered by the methodology	<b>OK</b>	<b>OK</b>
B.6.1.3. Are the formulae required for the determination of project emissions correctly presented, enabling a complete identification of parameter to be used and / or monitored?	PDD. B.6.2	DR	Yes, formulae to calculate the baseline emissions are correctly presented.	<b>OK</b>	<b>OK</b>

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B.6.1.4. Are the formulae required for the determination of baseline emissions correctly presented, enabling a complete identification of parameter to be used and / or monitored?	PDD B.6.1	DR	Yes, formulae to calculate the baseline emissions are correctly presented.	<b>OK</b>	<b>OK</b>
B.6.1.5. Is the choice of options to determine the emissions factor justified in a suitable and transparent manner?	PDD B.6.2	DR	Yes, CO2 emission default value of bunker oil C and natural gas is used and it is from 2006 IPCC Guidelines for National Greenhouse Gas Inventories for National Greenhouse Gas Inventories is used.	<b>OK</b>	<b>OK</b>
B.6.1.6 Are the formulae required for the determination of leakage emissions correctly presented, enabling a complete identification of parameter to be used and / or monitored?	PDD B.6.2	DR	No leakage is considered according to the methodology.	<b>OK</b>	<b>OK</b>
<b>B.6.2. Data and parameters that are available at validation</b>					
B.6.2.1. Is the list of parameters presented in chapter B.6.2 considered to be complete with regard to the requirements of the applied Methodology?	PDD B.6.2	DR	Yes, all parameters are listed in chapter B.6.2.	<b>OK</b>	<b>OK</b>
B.6.2.2. Is the choice of ex-ante or ex-post vintage of emission factors clearly specified in the PDD?	PDD B.6.2	DR	Yes. Emission factor of bunker oil C and natural gas are selected as ex-ante and those factors are from 2006 IPCC Guidelines for National Greenhouse Gas Inventories for National Greenhouse Gas Inventories.	<b>OK</b>	<b>OK</b>
B.6.2.3 Are all Parameters included followings properly? <ul style="list-style-type: none"> <li>- Title in line with methodology?</li> <li>- Data unit correctly expressed?</li> <li>- Appropriate description?</li> <li>- Source clearly referenced?</li> <li>- Correct value provided?</li> <li>- Has this value been verified?</li> <li>- Choice of data correctly justified?</li> <li>- Measurement method correctly described?</li> </ul>	PDD B.6.2	DR, I	Yes. all parameters are listed in chapter B.6.2. But some errors were identified as below: <ul style="list-style-type: none"> <li>- Data unit of <math>PG_y</math>, <math>NCV_{PG,y}</math>, <math>PG_{baseline}</math>, <math>NCV_{PG,baseline}</math> is not correct as <math>m^3</math> is being used at the site.</li> <li>- Steam enthalpy (767.7 kcal/kg) is used for baseline emission calculation and will be used in project emission calculation. However condition of this steam enthalpy is not provided, as well as reference of it.</li> <li>- Also evidence of some data such as <math>NCV_{WG,y}</math>, <math>NCV_{PG,baseline}</math> and <math>NCV_{LF,baseline}</math> shall be submitted.</li> </ul>	<b>CL 3</b>	<b>OK</b>
<b>B.6.3. Ex-ante calculation of emission reductions</b>					
B.6.3.1. Is the projection based on the same procedures as used for future monitoring?	PDD B.6.3	DR	Yes. the projection is based on the same procedure as for future monitoring.	<b>OK</b>	<b>OK</b>

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B.6.3.2. Are the GHG calculations documented in a complete and transparent manner?	DR,I	PDD B.6.3	Yes. Refer to B.6.3 of the PDD.	<b>OK</b>	<b>OK</b>
B.6.3.3. Is the data provided in this section consistent with data as presented in other chapters of the PDD?	DR, I	PDD B.6.3	Yes. the data in the PDD are consistent.	<b>OK</b>	<b>OK</b>
<b>B.6.4. Summary of the ex-ante estimation of emission reductions</b>					
B.6.4.1. Will the project results in fewer GHG emissions than the baseline scenario?	PDD B.6.4	DR, I	Yes. Estimation of emission reduction by this project activity is 19,635 ton CO <sub>2</sub> /yr.	<b>OK</b>	<b>OK</b>
B.6.4.2. Is the form/table required for the indication of projected emission reductions correctly applied?	PDD B.6.4	DR, I	Yes, the table has been correctly applied.	<b>OK</b>	<b>OK</b>
B.6.4.3. Is the projection in line with the envisioned time schedule for the project's implementation and the indicated crediting period?	PDD B.6.4	DR, I	Yes, this project was once submitted to the UNFCCC for registration on June 2007, but CDM EB instructed the prior DOE to suspend the validation procedure of the project due to the possible conflict of interest of the DOE with the project activity. Therefore, since then this project is under operation.	<b>OK</b>	<b>OK</b>
B.6.4.4. Is the data provided in this section in consistency with data as presented in other chapters of the PDD?	PDD	DR	Yes. The data are consistent.	<b>OK</b>	<b>OK</b>
<b>B.7. Application of the monitoring methodology and description of the monitoring plan</b>					
<b>B.7.1. Data and parameters monitored</b>					
B.7.1.1. Is the list of parameters presented by chapter B.7.1 considered to be complete with regard to the requirements of the applied methodology?	PDD B.7.1	DR,1	Yes. It is.	<b>OK</b>	<b>OK</b>
B.7.1.2 Are the parameter included followings properly? - Title in line with methodology? - Data unit correctly expressed? - Appropriate description of parameter?	PDD B.7.1	DR,1	Yes. all parameters are listed in chapter. The monitoring plan includes how all the data will be monitored to calculate emissions with QA/QC procedures.	<b>OK</b>	<b>OK</b>

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<ul style="list-style-type: none"> <li>- Source clearly referenced?</li> <li>- Correct value provided for estimation?</li> <li>- Has this value been verified?</li> <li>- Measurement method correctly described?</li> <li>- Correct reference to standards?</li> <li>- Indication of accuracy provided?</li> <li>- QA/QC procedures described?</li> <li>- QA/QC procedures appropriate?</li> </ul>					
<b>B.7.2. Description of the monitoring plan</b>					
B.7.2.1. Is the operational and management structure clearly described and in compliance with the envisioned situation?	PDD B.7.2	DR,1	Yes. Operational and management structure of the project activity is well described in section B.7.2 of the PDD. Validation team confirmed this operational and management structure through organizational structure at the site.	OK	OK
B.7.2.2. Are responsibilities and institutional arrangements for data collection and archiving clearly provided?	PDD B.7.2	DR,1	Yes. According to LG Chem, Ltd.'s provision, responsibilities and institutional arrangement for data collection and archiving are described in the PDD. Measurement at the site is connecting with DCS and person in charge of engineering and management has collection and archiving duties.	OK	OK
B.7.2.3. Does the monitoring plan provide current good monitoring practice?	PDD B.7.2	DR,1	Yes. Please refer B.7.1.2.	OK	OK
B.7.2.4. If applicable: Does annex 4 provide useful information enabling a better understanding of the envisioned monitoring provisions?	PDD B.7.	DR, I	N/A	OK	OK
<b>B.8. Date of completion of the application of the baseline study and monitoring methodology an the name of the responsible person(s)/entity(ies)</b>					
B.8.1. Is there any indication of a date when the baseline was determined?	DR, I	PDD B.8.1	Yes. The baseline of the first version of PDD was determined on 31 October 2008.	OK	OK
B.8.2. Is the information on the person(s) / entity(ies) responsible for the application of the baseline and monitoring methodology provided consistent with the actual situation?	DR, I	PDD B.8	Yes, The responsible person of the application of the baseline and monitoring methodology is also the ones being interviewed for baseline verification during the on site assessment.	OK	OK

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B.8.3. Is information provided whether this person/entity is also considered a project participant?	DR, I	PDD B.8	Yes. Name of the responsible entity, Clean Energy Finance Committee, Mitsubishi UFJ Securities Co.,Ltd. is clearly indicated in the PDD.	OK	OK
<b>C. Duration of the Project/ Crediting Period</b>					
C.1 Are the project's starting date and operational life time clearly defined and evidenced?	PDD C.1	DR, I	The starting date has been set as date of purchase order for natural gas burners, 21/06/2006. The operational lifetime is expressed to be 20 years.	OK	OK
<b>C.2. Choice of the crediting period and related information</b>					
C.2.1. Is the assumed crediting period clearly defined and reasonable (renewable crediting period of max 7 years with potential for 2 renewals or fixed crediting period of max.10 years)?	PDD C.2.2	DR	Yes. Fixed crediting period, 10 yrs has been selected and it is reasonable as operational life time of this project activity is expected to be 20 years.	OK	OK
C.2.2. Is the start of the crediting period clearly defined and reasonable?	PDD C.2.2.1	DR,I	Yes. Starting date of crediting period will start 10 May 2009 or on the date of registration of the project activity	OK	OK
<b>D. Environmental Impacts</b>					
<b>D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts</b>					
D.1 Has an analysis of the environmental impacts of the project activity been sufficiently described?	PDD D.1	DR,I	There are no host country requirements for EIA for this kind of project activity. However, likely environmental impacts have been discussed in the PDD.	OK	OK
D.2 Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved?	PDD D.1	DR, I	Enforcement Decree of the Act on Assessment of Impacts of Works on Environment, Traffic, Disasters, etc.” describes projects for which an Environment Impact Assessment (EIA) is required. Under the Act, the proposed Project activity does not require the completion of an EIA	OK	OK



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D.3 Will the project create any adverse environmental effects?	PDD D.1	DR, I	No. In actual fact, the Project activity will help to improve local air quality as well as mitigate climate change. Since the natural gas will not contain sulphur, it is expected that emissions of SO <sub>x</sub> will be reduced by more than 90% comparing to the baseline situation (bunker fuel oil C consumption). It is also expected that emissions of NO <sub>x</sub> will be reduced by the Project activity	<b>OK</b>	<b>OK</b>
D.4 Are transboundary environmental impacts considered in the analysis?	PDD. D.1	DR, I	There is no trans-boundary impact.	<b>OK</b>	<b>OK</b>
<b>D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Part</b>					
D.2.1 Have identified environmental impacts been addressed in the project design?	PDD D.1	DR, I	Yes. Refer to D.3	<b>OK</b>	<b>OK</b>
D.2.2 Does the project comply with environmental legislation in the host country?	PDD D.1	DR, I	Yes. Refer to D.3	<b>OK</b>	<b>OK</b>
<b>E. Stakeholder Comments</b>					
<b>E.1. Brief description how comments by local stakeholders have been invited and compiled</b>					
E.1.1 Have relevant stakeholders been consulted?	PDD E.1	DR, I	Yes. The stakeholder consultation for the project activity took place on 28 July 2006. Also a consultation was carried out via media, Local network and newspaper, invite local stakeholders' comments on this project.  Evidence of above consultation process were identified through the documents such as meeting minutes and memorandums of the meeting provided by PP	<b>OK</b>	<b>OK</b>
E.1.2 Have appropriate media been used to invite comments by local stakeholders?	PDD. E.1	DR, I	Yes. Please kindly refer E.1.1 of protocol.	<b>OK</b>	<b>OK</b>

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E.1.3 If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	PDD E.1	DR, I	There are no regulations/laws in Korea for carrying out the stakeholder consultation process for this project activity.	<b>OK</b>	<b>OK</b>
E.1.4. Is the undertaken stakeholder process that was carried out described in a complete and transparent manner?	PDD. E.1	DR, I	Yes. The PDD transparently defines the stakeholder consultation process adopted.	<b>OK</b>	<b>OK</b>
<b>E.2. Summary of the comments received</b>					
E.4 Is a summary of the stakeholder comments received provided and is the stakeholders commented identified?	PDD E.2	DR, I	Yes. A stakeholders' meeting was conducted by LG Chem, Ltd. on July 28, 2006. The meeting took place at the Project plant in Naju. A total of 17 local inhabitants attended the meeting and showed strong interest in the Project as it will help to improve local air quality.  There were 2 received comments from the local stakeholders and it is well described in the PDD. And validation team identified those comments through their meeting minutes.	<b>OK</b>	<b>OK</b>
E.5 Has due account been taken of any stakeholder comments received?	PDD E.3	DR, I	Received 2 comments are not significantly negative comments. PP replied to received comments and local stakeholders were satisfied with their response.	<b>OK</b>	<b>OK</b>
<b>F. Annexes 1-4</b>					
<b>Annex 1: Contact Information</b>					
F.1.1 Is the information provided consistent with the one given under section A.3?	PDD A.3/ Anne x 1	DR	Yes, the information provided is consistent with one given under section A.3.	<b>OK</b>	<b>OK</b>
F.1.2 Is the information on all private participants and directly involved Parties presented?	PDD A.3/ Anne x 1	DR	Yes.	<b>OK</b>	<b>OK</b>
<b>Annex 2: Information regarding public funding</b>					

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F.1.3 Is the information provided on the inclusion of public funding (if any) in consistency with the actual situation presented by the project participants?	PDD A.4.5/ Anne x 2	DR,I	It is stated that the project does not receive any public funding from Annex I countries as this project activity is unilateral project.	<b>OK</b>	<b>OK</b>
F.1.4. If necessary: Is an affirmation available that any such funding from Annex – countries does not result in a diversion of ODA?	PDD A.4.5/ Anne x 2	DR	N/A	<b>OK</b>	<b>OK</b>
<b>Annex 3: Baseline information</b>					
F.1.5. If additional background information on baseline data is provided: Is this information consistent with data presented by other section of the PDD?	PDD B.5/A nnex 3	DR,I	Yes. Please kindly refer to B.5 of protocol. All the data used for baseline calculation are consistent throughout the PDD.	<b>OK</b>	<b>OK</b>
F.1.6.Is the data provided verifiable? Has sufficient evidence been provided to the validation team?	PDD B.5/A nnex 3	DR,I	Pls. see B.5 of protocol.	<b>OK</b>	<b>OK</b>
F.1.7.Does the additional information substantiate/support statements given in other section of the PDD?	Anne x 3	DR	Annex 3 presents all the data used for the emission factor calculation.	<b>OK</b>	<b>OK</b>
<b>Annex 4: Monitoring information</b>					
F.1.8.If additional background information on monitoring is provided: Is this information consistent with data presented in other section of the PDD?	PDD B.7.2/ Anne x 4	DR,I	N/A	<b>OK</b>	<b>OK</b>
F.1.9.Is the information provided verifiable? Has sufficient evidence been provided to the validation team?	PDD B.7.2/ Anne x 4	DR,I	N/A	<b>OK</b>	<b>OK</b>
F.1.10.Do the additional information and/or documented procedures substantiate/support statements given in other section of the PDD?	PDD B.7.2/ Anne x 4	DR,I	N/A	<b>OK</b>	<b>OK</b>

**Table 3. Resolution of Corrective Action and Clarification Requests**

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<b>CAR 1:</b>  LoA of Korea and Japan have been submitted to DOE. As this project was re-validated, current status of project activity should be noticed to Korea DNA and result of it should be provided to DOE.	A.3.3	LoA of Korea and Japan have been submitted to DOE. According to Korea DNA's rules, current status of project activity was noticed to Korea DNA as this project was re-validated. Korea DNA didn't provide any negative comment on this proposed project activity.	CAR 1 is closed.
<b>CAR 2:</b>  Lifetime of this proposed project activity as mentioned in the PDD is 20 years, but it was not demonstrated during on-site assessment. Please kindly provide evidence that shows lifetime of project activity is 20 years and project technology would not be substituted during the crediting period.	A.4.3.6	The burners are provided by HAMWORTHY COMBUSTION, which is one of the world's largest combustion equipment manufacturers, with the experiences of equipment installation in over 100 countries.  Burner supplier provided statement which show lifetime of burner is at least 20 years as clean fuel, natural gas, is used in the burner which minimizes trouble in the burner. Also in general, boiler and burner can be used permanently under proper maintenance.  Based on expert's opinion and site inspection, validation team confirmed that lifetime of this project activity is 20 years.	CAR 2 is closed.

<p><b>CAR 3:</b></p> <p>Starting date of the project activity is 21 June 2006 which is date of purchase order for natural gas burners and is the earliest date among implementation, construction and real action. But, provide main equipment purchase contract document to assess which date is earliest date of implementation, construction and real action.</p> <p>According to the CDM glossary, evidence to support awareness of the CDM prior to the project activity start date should include minutes and/or notes related to the consideration of the decision by the Board of Directors, or equivalent, of the project participant, to undertake the project as a proposed CDM project activity. Please provide documented evidence to support awareness of the CDM consideration before 21 June 2006.</p>	<p>B.5.1</p>	<p>Starting date of project activity is 21 June 2006 and this is the earliest date of implementation, construction and real action as PP has committed to expenditure related to the implementation or related to the construction of the project activity.</p> <p>There are other dates which could be used, as CDM consulting agreement (2006-05-29), which is earlier than purchase order for natural gas burner. However validation team confirmed that 21 June 2006 is more appropriate for starting date, taking into account that no real action could be done in the project without this purchase order, and it therefore marks the beginning of real action of the project activity.</p> <p>Evidence of CDM consulting agreement and purchase order for natural gas burners was submitted to DOE and validation team concluded that 21 June 2006 is valid among various evidences.</p> <p>And PP provided evidences to support awareness of the CDM consideration before date of purchase order (21 June 2006) which has been set as s starting date of project activity.</p> <p>PP got a CEO approval proceed into fuel switching project activity as a CDM project activity on 14 December 2005 and this decision was made based on the plan of the fuel switching project in Naju plant on 11 November 2005. In this plan, revenue from this project was analyzed and compared benefits with CDM and without CDM.</p> <p>All of these activities were evidenced and validation team concluded provided evidence shows that awareness of the CDM prior to the project activity start date and following table presents timeline of the project activity and CDM consideration.</p>	<p>CAR 3 is closed.</p>
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		Date	Description	
		2005-11-11	Introduce fuel switching activity as CDM project with consideration of CDM benefits.	
		2005-12-14	CEO of LG Chem, Ltd. made final decision to proceed into the fuel switching project activity as a CDM project activity.	
		2006-01	Mitsubishi UFJ Securities was selected as CDM consultant.	
		2006-05-29	CDM consulting agreement was finalized	
		2006-06-21	Purchase order for natural gas burners. Set as starting date of project activity.	
		2006-07	Validation contract was finalized with KEMCO	
		2006-09-30	Start of boiler retrofit	
		2006-11	Test run of project activity	
		2007-06	Request for registration was submitted	
		2007-11	CDM EB instructed the DOE to suspend the validation procedure of project activity due to the possible conflict of interest of the DOE with the project activity.	
		2008-03	Request for registration was withdrawn due to the DOE's incapability of validation for the project activity	
		2008-07	Validation contract was finalized with KFQ.	

<p><b>CAR 4:</b></p> <p>Project additionality has been assessed by analyzing the investment barrier.</p> <p>As described in the PDD, NPV of the total cost for project scenario is higher than that of baseline scenario, which means that the Project activity is not economically attractive. However following were identified to clarify:</p> <ul style="list-style-type: none"> <li>- O&amp;M includes fuel consumption for bunker fuel oil C heating, imported electricity cost for pumps, maintenance costs and after-treatment cost, but validity of each cost item were not demonstrated.</li> <li>- Amount of fuel consumption and cost of Bunker fuel Oil C and natural gas shall be demonstrated.</li> </ul> <p>Justification of selected parameters and variation range for sensitivity analysis was not provided.</p>	<p>B.5.5</p>	<ul style="list-style-type: none"> <li>- Fuel consumption for bunker fuel oil is estimated based on historic data of 3 years (2003.11~2006.10) which is real consumption data at Naju Plant. The input value of this fuel consumption for bunker fuel oil C in investment analysis is slightly different the data at the time of decision due to error in data gathering method was founded during on-site assessment. And this change influenced expected fuel consumption of natural gas for project activity.</li> <li>- O&amp;M cost of baseline scenario is calculated based on historic data and evidence of each cost item was submitted to DOE. of decision making. Each expense is demonstrated by evidence provided by PP and validation team cross-checked items included in O&amp;M Cost and expenditure in 2005. Thus this input value was re-calculated as 329,000,000 KW/yr based on technical review about reduction of electricity consumption to operate pumps, electric precipitator, oil heater and etc. KFQ confirmed that included cost items are acceptable and each expense has validity at the time of decision</li> <li>- PP used average (2003 ~ 2005) fuel price of bunker fuel oil C and natural for investment analysis and source of bunker fuel oil C price is based on receipt and KOGAS for latter one. During the site visit, several purchase receipts of bunker fuel oil C and natural gas were verified, confirming the prices referred in the PDD and justifying the assumptions made in the NPV analysis. The trends in fuel oil and natural gas consumption in Naju city and the sector were analyzed and KFQ has been able to confirm the appropriateness of the analysis.</li> <li>- A sensitivity analysis has been carried out for parameter contributing more than 20% to revenues or costs. Reasonable variations of the initial equipment cost, O&amp;M cost, fuel price of natural price and discount rate were checked to confirm whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. It deems reasonable to use the applied method and substantial variation of these parameters have been moreover considered unlikely to occur:</li> </ul> <p>1) Initial equipment: As this project activity is under operation, it is hardly to increase initial equipment cost as it is already had been paid.</p>	<p>CAR 4 is closed.</p>
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# APPENDIX A. KFQ VALIDATION PROTOCOL \_SSC

		<p>2) O&amp; M Cost: KFQ checked that the range of fluctuation in O&amp;M cost is within +/- 10% in past years and distribution of O&amp;M cost of each year is also less than +10%.</p> <p>3) Natural gas price: KFQ checked that the range of fluctuation in natural gas price is within +/- 10% in past 3 years and distribution of natural gas price of each year is also less than +10%. Thus decreasing natural gas price is unlikely to occur.</p> <p>As described above, NPV of total cost for project scenario is always higher than that of baseline scenario, confirming the robustness of economical attractiveness of baseline scenario.</p> <p>In conclusion, KFQ confirms that the additionality of the projects has been sufficiently demonstrated and this project is financially unattractive.</p>	
<p><b>CAR 5:</b></p> <p>Calculation method of baseline emission and project emission is based on using energy of the boiler if combusted with natural gas. According to methodology applied, actual amount of energy consumption shall be used in emission reduction calculation over crediting period.</p>	B.6.1.1	<p>According to AMS-III.B, PP used fuel consumption to estimate baseline emission and emission factor based on 3 years data prior to project implementation and calculated ex-ante emission factor for baseline and project scenario.</p> <p>And consumed natural gas will be used in project emission calculation. Validation team confirmed that the way to estimate baseline scenario is correctly applied.</p>	CAR 5 is closed.
<p><b>CL 1:</b></p> <p>According to specification of boiler, boiler efficiency of project scenario is same as baseline scenario because of boiler is being used as usual, but it was stated as more than 91% in the PDD version 10.1. Thus correct information should be provided in the PDD.</p>	A.4.3.1	<p>Efficiency of boiler is 91% and validation team confirms that this efficiency is correct as there is only retrofitting the boilers to allow fuel switching from Bunker fuel oil C to natural gas.</p> <p>PP indicated correct information on boiler efficiency in the PDD and validation team identified this value is appropriated through nameplate and specification provided by equipment supplier.</p>	CL 1 is closed.



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<p><b>CL 2:</b></p> <p>Before start of project activity, the operators have received education from the domestic agent of the burner manufacturer, Heungkuk Industries Co.,Ltd, for proper operation of the boiler in 19 November 2006.</p> <p>Also procedure for training and maintenance of equipments were shown during on-site assessment. However this was not stated in the PDD, and please submits evidence of this training.</p>	<p>A.4.3.7</p>	<p>Evidence of received training from the domestic agent is submitted to DOE.</p>	<p>CL 2 is closed.</p>
<p><b>CL 3:</b></p> <p>All parameters are listed in chapter B.6.2. But some errors were identified like below:</p> <ul style="list-style-type: none"> <li>- Data unit of <math>PG_y</math>, <math>NCV_{PG,y}</math>, <math>PG_{baseline}</math>, <math>NCV_{PG,baseline}</math> is not correct as <math>m^3 s</math> being used instead of <math>Nm^3</math>.</li> <li>- Steam enthalpy (767.7 kcal/kg) is used for baseline emission calculation and will be used in project emission calculation. However condition of this steam enthalpy is not provided, as well as reference of it.</li> <li>- Also evidence for <math>NCV_{WG,y}</math>, <math>NCV_{PG,baseline}</math> and <math>NCV_{LF,baseline}</math> shall be submitted.</li> </ul>	<p>B.6.2.3</p>	<ul style="list-style-type: none"> <li>- Data unit of <math>PG_y</math>, <math>NCV_{PG,y}</math>, <math>PG_{baseline}</math>, <math>NCV_{PG,baseline}</math> is corrected as <math>Nm^3</math> which is being used at the site.</li> <li>- Condition of steam enthalpy is provided and evidenced by ‘Spirax Sarco (<a href="http://www.spiraxsarco.com/resources/steam-tables.asp">http://www.spiraxsarco.com/resources/steam-tables.asp</a>) and this is used for calculation of steam generation by bunker fuel oil C in the baseline situation.</li> <li>- Evidence of <math>NCV_{WG,y}</math>, <math>NCV_{PG,baseline}</math> and <math>NCV_{LF,baseline}</math> were submitted to DOE and validation team confirmed that correct value were used in calculation of baseline scenario.</li> </ul>	<p>CL 3 is closed.</p>

Appendix B  
Qualification of Validation Team

## APPENDIX B. QUALIFICATION OF VALIDATION TEAM

<div data-bbox="810 261 963 309"></div> <div data-bbox="300 363 909 403"><h3>GHG Validator/Verifier Certificate</h3></div> <div data-bbox="461 462 748 505"><h4>Jong-Mun Park</h4></div> <div data-bbox="421 515 788 544"><p>Certificate number: GHG 04005</p></div> <div data-bbox="387 564 822 595"><p>Sectoral Scope: 01,04,05,08,10,11,12,13</p></div> <div data-bbox="412 614 799 644"><p>Expert Scope: 04,05,08,10,11,12,13</p></div> <div data-bbox="499 662 710 691"><p>Date: 27 Dec 2007</p></div> <div data-bbox="295 759 916 938"><p>This validator/verifier is qualified by KFQ's Qualification requirements to conduct validation and verification for Carbon offset project and organization's Greenhouse Gas Emissions Report.</p></div> <div data-bbox="468 979 741 1010"><p>Valid until: 26 Dec 2010</p></div> <div data-bbox="347 1029 864 1061"><p>Authorized by Korean Foundation for Quality</p></div> <div data-bbox="241 1168 542 1248"><p>한국품질재단 한국품질인증센터 Korean Foundation for Quality</p></div> <div data-bbox="629 1149 931 1238"><p>재단법인 한국품질재단 한국품질인증센터 이 사 장 김 우</p></div> <div data-bbox="560 1248 963 1273"><p>www.kfq.or.kr 13FL, Woolim Lion's Valley B Bld., 371-28, Gasan-Dong, Geumcheon-Gu, Seoul 153-803, Korea</p></div>	<div data-bbox="1778 226 1926 274"></div> <div data-bbox="1294 355 1881 395"><h3>GHG Validator/Verifier Certificate</h3></div> <div data-bbox="1464 458 1706 502"><h4>Mi Jung LEE</h4></div> <div data-bbox="1408 515 1762 544"><p>Certificate number: GHG 08001</p></div> <div data-bbox="1442 564 1727 598"><p>Sectoral Scope: 01, 02, 03</p></div> <div data-bbox="1476 670 1695 700"><p>Date: 30 June 2008</p></div> <div data-bbox="1290 772 1888 963"><p>This validator/verifier is qualified by KFQ's Qualification requirements to conduct validation and verification for Carbon offset project and organization's Greenhouse Gas Emissions Report.</p></div> <div data-bbox="1451 1008 1722 1038"><p>Valid until: 26 Dec 2010</p></div> <div data-bbox="1339 1061 1839 1093"><p>Authorized by Korean Foundation for Quality</p></div> <div data-bbox="1240 1190 1541 1259"><p>한국품질재단 Korean Foundation for Quality</p></div> <div data-bbox="1610 1163 1890 1260"><p>재단법인 한국품질재단 이 사 장 유 영</p></div> <div data-bbox="1534 1267 1926 1294"><p>www.kfq.or.kr 13FL, Woolim Lion's Valley B Bld., 371-28, Gasan-Dong, Geumcheon-Gu, Seoul 153-803, Korea</p></div>
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