

VALIDATION REPORT

GOCHANG SOLAPARK 14.98MW PHOTOVOLTAIC POWER PLANT PROJECT

REPORT No. GHGCC(A)08-021

REVISION No. 04

GHG Certification Office

KOREA ENERGY MANAGEMENT CORPORATION



VALIDATION REPORT

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Client: Gochang Solarpark Co., Ltd.	Client ref.: Mr. Park, Hyun-Woo
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Final PDD (version and date)	Version 07, 04/01/2010
<p>Summary:</p> <p>The Korea Energy Management Corporation (KEMCO) Validation Team has conducted validation of the "Gochang solarpark 14.98MW photovoltaic power plant project" in Republic of Korea to ensure that the proposed project is in conformity with all applicable CDM requirements including the CDM modalities and procedures, and relevant decisions by the COP/MOP and the CDM Executive Board.</p> <p>The validation consisted of following three phases:</p> <ol style="list-style-type: none"> 1) Desk review of the project design, baseline methodology and monitoring plan, and relevant data and information; 2) On-site assessment and follow-up interviews with relevant stakeholders in the host country, personnel with knowledge of the project design and implementation; and, 3) Resolution of outstanding issues and issuance of the final validation report and opinion. <p>During the validation, the Team assessed, using objective evidence, the completeness and accuracy of the claimed emission reductions and conservativeness of the assumptions made in the project design document (PDD). In addition, based on its sectoral and regional expertise, the Team assessed whether the project activity complies with the relevant requirements set out in the CDM modalities and procedures, the applicability conditions of the selected methodology and guidance issued by the CDM Executive Board.</p> <p>In summary, KEMCO is of the opinion that the project, as described in the project design document as of 4 Jan 2010, meets all applicable UNFCCC requirements for the CDM and correctly applies the approved baseline and monitoring methodology AMS I.D (version 13). Hence, KEMCO requests the registration of the "Gochang solarpark 14.98MW photovoltaic power plant Project" as a CDM project activity.</p>	

Report No.: GHGCC(A)-08-021	Subject Group:	
Report title: Gochang solarpark 14.98MW photovoltaic power plant project		
Work carried out by: Park, Kyung-Soon, Han, Seung-Ho		
Work verified by: Lee, Hoon-Goo		
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Indexing terms

UNFCCC/Kyoto Protocol/CDM

Validation / Verification

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Abbreviations

Explain any abbreviations that have been used in the report here.

BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CL	Clarification request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
DNA	Designated National Authority
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
KEMCO	Korea Energy Management Corporation
LOA	Letter of Approval
MP	Monitoring Plan
NGO	Non-governmental Organisation
ODA	Official Development Assistance
OM	Operating Margin
PDD	Project Design Document
UNFCCC	United Nations Framework Convention on Climate Change
(CDM) VVM	Clean Development Mechanism (CDM) Validation and Verification Manual

Conversion Factors and Definitions

Insert and describe any conversion factors used in the report here. In addition, define any specific terminology used in the report.



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1 INTRODUCTION

The Gochang solarpark Co., Ltd. has commissioned Korea Energy Management Corporation (KEMCO) to perform a validation of the “Gochang solarpark 14.98MW photovoltaic power plant project” in Republic of Korea (hereafter called “the project”). This report summarises the validation findings for the project, as well as means of validation to assess the correctness of the information provided by the project participants.

The validation team consisted of the following personnel:

Role	Name	Organization	Scope of work
Team Leader, Validator	Park, Kyung-Soon	KEMCO GHG Certification Office	Baseline and Monitoring methodology, Estimation of GHG emission reductions
Lead GHG Validator	Han, Seung-Ho	KEMCO GHG Certification Office	Sustainable Development, Environmental impacts, Stakeholder comments

1.1 Objective

The purpose of validation is to ensure a thorough, independent assessment of proposed project activities submitted for registration as a proposed CDM project activity against all applicable CDM requirements. In particular, application of the baseline and monitoring methodology and demonstration of the project additionality is validated through document review, on-site observation, and interviews with relevant stakeholders and personnel.

1.2 Scope

The validation scope is defined as an independent and objective review of:

- Technical description of the project;
- GHG sources and types to be included within the project boundaries;
- Baseline scenario;
- Project additionality;
- Monitoring plan;
- Environmental impacts by the proposed project; and,
- Comments by local stakeholders

The validation scope can be extended depending on project-specific situations or required by relevant decisions by the COP/MOP and the CDM Executive Board.



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1.3 GHG Project Description

The Gochang solarpark 14.98MW photovoltaic power plant project is a grid-connected photovoltaic power plant which is located in Gochang-Gun, Jeollanbuk-Do, Republic of Korea. The total installed capacity of this project is 14.98MW ($5 \times 3\text{MW}$) and the project area is about $390,885\text{m}^2$. The annual generation of electricity is estimated at 22,183MWh and resulting emission reductions will arrive at 13,523tCO₂e/year, by displacing electricity generation by fossil fuel-fired plants.

The project is expected to significantly contribute to sustainable development such as acquaintance of advanced technological experiences and maintenance know-how as follows.

- Reduction of GHG emissions
- Diversification sources of electric generation
- Pilot PV power project to bring know-how to the host country and project developers
- Creation of job opportunities directly and/or indirectly
- Contribution toward improvement of air quality and better living conditions of the country



2 METHODOLOGY

The validation may consist of the following three phases:

- 1) Desk review of the project design, baseline methodology and monitoring plan, and relevant data and information;
- 2) On-site assessment and follow-up interviews with relevant stakeholders in the host country, personnel with knowledge of the project design and implementation; and,
- 3) Resolution of outstanding issues and issuance of the final validation report and opinion.

In order to ensure transparency, a validation protocol was customized for the project, according to the Validation and Verification Manual. The protocol shows in 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 Figure1. 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 validation team may also use the term Clarification, which would be where:

- iv) additional information is needed to fully clarify the issue.



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Validation Protocol Table 1: Mandatory Requirements			
Requirement	Reference	Conclusion	Cross reference
The requirements the project must meet.	Gives reference to the legislation or agreement where the requirement is found.	This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) of risk or non-compliance with stated requirements. The corrective action requests are numbered and presented to the client in the Validation report.	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.

Validation Protocol Table 2: Requirement checklist				
Checklist Question	Reference	Means of verification (MoV)	Comment	Draft and/or Final Conclusion
The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in seven different sections. Each section is then further sub-divided. The lowest level constitutes a checklist question.	Gives reference to documents where the answer to the checklist question or item is found.	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.	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.	This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) due to non-compliance with the checklist question (See below). Clarification is used when the validation team has identified a need for further clarification.

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

Figure 1 Validation protocol tables



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2.1 Review of Documents

The Project Design Document (PDD) version 02 dated 09/01/2009 submitted initially and final version 07 /1/ dated 04/01/2010 along with additional background document /2/ - /18/ related to the project design and baseline were assessed as a part of validation.

The desk review focused mainly on the following aspects:

- Participation Requirement
- Project Design Document
- Project Additionality
- Sustainable Development and Approval by Parties involved
- Baseline Methodology and Project Baseline
- Monitoring Methodology and Plan – Coverage of Emission Sources
- Monitoring Practices and GHG Data Management

2.2 Follow-up Interviews

On 10th February 2009, KEMCO performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. Technical managers of Gochang solarpark Co., Ltd., Project consultants of Ecoeye Co., Ltd., local government officers were interviewed. The main topics of the interviews are summarized in Table 1.

Table 1 Interview topics

Interviewed organisation	Interview topics
Gochang solarpark Co., Ltd.	<ul style="list-style-type: none"> ➤ Project background information ➤ Project technology, operation, maintenance and monitoring capability ➤ Project additionality ➤ Project monitoring and management plan. ➤ Project approval status (incl. EIA approval, CDM project status) ➤ Stakeholder consultation process
Ecoeye Co., Ltd.	<ul style="list-style-type: none"> ➤ Application of selected baseline and monitoring methodology ➤ Baseline determination ➤ Emission reduction calculation ➤ Emission reduction monitoring plan
Local government officers	<ul style="list-style-type: none"> ➤ Environmental impact ➤ Local stakeholder's comments

2.3 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation was to resolve the requests for corrective actions and clarification and any other outstanding issues which needed to be clarified for KEMCO's positive conclusion on the project design. The Corrective Action Requests and Clarification Requests raised by KEMCO, presented to the project participant in KEMCO's NC report as of 10th February 2009 were resolved during communications between the project participants and KEMCO. To guarantee the transparency of the validation process, the concerns raised and responses given are documented in the validation protocol in Appendix A.



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Since modification to the project design were necessary to resolve KEMCO's concerns, the client decided to revise the PDD and resubmitted the PDD as version 02. After reviewing and assessing the revised PDD, KEMCO issued this final validation report and opinion.

2.4 Internal Quality Control

The final validation report underwent technical review before requesting registration of the project activity. The technical review was performed by one Review Member qualified in accordance with KEMCO's Committee Operation Procedure mainly in terms of validation procedures and results, and approved by Director of KEMCO's GHG Certification Office.



3 VALIDATION FINDINGS

In the following sections the findings of the validation are stated. The validation findings for each validation subject are presented as follows:

- 1) The findings from the desk review of the original project design documents, and the findings from physical site inspection and interviews during the follow-up visit are summarised. These findings are in detail described in the Validation Protocol in Appendix A.
- 2) Where the validation team had identified issues that needed clarification or that represented a risk to the fulfilment of the project objectives, a Clarification or Corrective Action Request, respectively, have been issued. The Clarification and Corrective Action Requests are stated, where applicable, in the following sections and are further documented in the Validation Protocol in Appendix A. The validation of the Project resulted in ten Corrective Action Requests and two Clarification Requests.
- 3) Where Clarification or Corrective Action Requests have been issued, the communications between the Client and KEMCO to resolve these Clarification or Corrective Action Requests are summarised.
- 4) In conclusion, the validation opinion of the validation team has been presented.

The final validation findings are based on the project design document (version 07, dated 4 Jan 2010) and re-submitted supporting documentation.

3.1 Participation Requirement

The project participant is Gochang solarpark Co., Ltd., Republic of Korea which ratified the Kyoto Protocol on 08/11/2002, and established DNA within the Prime Minister's Office.

The DNA of Korea has issued a Letter of Approval (LOA) /9/, authorizing Gochang solarpark Co., Ltd. as project participant and confirming that the project assists in achieving sustainable development. KEMCO received this letter from the project participant.

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

3.2 Project Design

The project is a grid-connected photovoltaic power plant of which capacity is 14.98MW. By supplying electricity to the grid with renewable resources, the project will reduce greenhouse gas emissions by avoiding CO₂ emissions from electricity generation by fossil fuel power plants in Republic of Korea. The Validation Team noted that the proposed project received the license for grid connection from the Ministry of Commerce, Industry, and Energy.

The project is to transmit and spread the advanced foreign technologies and the main PV generation facilities used in the project were SW-175/SW-180 made by Solarworld Co., Ltd.



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The expected lifetime of the project is about 20 years. A fixed crediting period of 10 years has been chosen for the project, starting from 1st Nov 2009. The emission reductions are estimated to be 13,523 tCO₂/year and 135,225 tCO₂ over the ten years of crediting period.

The PDD is in accordance with the applicable CDM requirements for completing PDDs such as forms and guidance.

Based on PV cell efficiency and weather conditions such as solar radiation in the local area, the estimated load factor for the PV systems is 16.9%. This value was validated by cross-checking the official document prepared by the Gochang County Planning Committee for the approval of the Provincial Government on the proposed project.

With regards to the project design, three CARs were raised and closed out as follows;

- **CAR1:** The efficiency of PV cells means the conversion ratio of solar radiation to electricity energy. But, the PDD described the cell efficiency wrong by providing the same value as the load factor, viz. 16.9%. So, the PV cell efficiency should be corrected as evidenced by technical specifications. (see Appendix B. Checklist A.4.3);
 - **Corrective Action:** The PV cell efficiency for the project activity, 15% is provided properly in the Table A-3, Technology Description of the PDD.
 - **Conclusions:** It is confirmed that the information on PV cell efficiency is appropriately provided. The corrected value of PV cell efficiency, 15% is also deemed reasonable based on the validation Team's sector-specific expertise.
- **CAR2:** Table A-4 in the PDD presents annual estimation of emission reductions attributable to the project activity. But, the crediting period of Year 10 in the Table is described wrong. (see Appendix B. Checklist A.4.4);
 - **Corrective Action:** The crediting period for annual emission reductions in Year 10 is corrected.
 - **Conclusions:** It is confirmed that the Table A-4 is corrected.
- **CAR3:** The starting date of the crediting period is not described consistently between Table A-4 and Section C.2.1. in the PDD. (see Appendix B. Checklist A.4.4 and C.2.1);
 - **Corrective Action:** The starting date of the first crediting period is corrected consistently with Table A-4 and Table B-7.
 - **Conclusions:** It is confirmed that the starting date of the first crediting period is corrected.



3.3 Baseline and Monitoring Methodology

The project applies the approved baseline and monitoring methodology for small-scale projects because the total generation capacity does not exceed the limit of small scale CDM project for renewable energy. As the project involves installation of photovoltaic (PV) systems and generates electricity utilizing renewable resources, viz. solar radiation, and supply it to the grid, the approved methodology pursuant to “Simplified Modalities and Procedures for small scale CDM project activities,” AMS I.D (version 13) is applied.

The spatial extent of the project boundary is clearly defined as the project site and all power plants connected physically to the national grid system, managed by KEPCO (Korea Electric Power Corporation).

Given that the dispatch data for electricity system in the KEPCO is not available and low-cost/must run resources constitute less than 50% of total grid generation in average of the 5 most recent years, Simple OM (Operating Margin) method was chosen. In addition, the project proponent calculated BM (Build Margin) taking into account the set of power capacity additions in the electricity system that comprise 20% of the system generation and that have been built most recently since it represents the larger annual generation than the set of five power units that have been built most recently

CM (Combined Margin) is accordingly calculated using the “Tool to calculate the emission factor for an electricity system (ver 01)”. The weighting factor is set to be respectively $W_{OM} = 75\%$ and $W_{BM} = 25\%$ during the crediting period.

With regards to selection of Simple OM, one CAR were raised and closed out as follows;

- **CAR4:** In line with the Tool to calculate the emission factor for an electricity system (version 01.1), the project proponent chose Simple OM method to determine the CO₂ emission factor for the baseline emissions. But, data on constitution of low-cost and must-run resources are not most recently available ones. (see Appendix B. Checklist B.4.6);
 - **Corrective Actions:** Electricity generations by sources for the most recent five years are provided to justify the selection of Simple OM.
 - **Conclusions:** The selection of Simple OM is sufficiently justified.

In order to demonstrate additionality, the PDD employed investment analysis and sensitivity analysis, then, showed that the project is not financially attractive under the baseline scenario by using the “Tool for the demonstration of additionality (ver.5)”. Specifically the Project Proponent performed NPV calculations using the government bond rate as a discount rate and demonstrated that NPV remains not financially attractive under positive and negative variations of key input values.

The starting date of the project was 28 June, 2007 on which the purchase agreement was signed for solar modules required for the proposed activity. It is in accordance with the “Glossary of CDM terms (ver03)”, and the project is an existing project by the guidance from EB 41, Annex 46.



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As the starting date is before the date of the commencement of validation (Period for global stakeholder comments: 29 Jan 2009 - 27 Feb 2009), it has been assessed whether or not the incentive of the CDM was seriously considered in the decision to proceed with the project activity. In this regard, the minutes of the Board Meeting dated 2 Feb 2007 are submitted to demonstrate serious consideration of CDM benefits before the start date of the project activity. In addition, continuing and real actions since the investment decision for the project activity are provided.

It was validated that all parameters and assumptions of the proposed project are accurate and suitable in light of relevant accounting practices as follows:

- Investment costs: the investment costs for the proposed project were confirmed by cross-check with the official document prepared by the Gochang County Planning Committee for the approval of the Provincial Government on the proposed project. The costs were double-checked with the loan agreement with a bank for the proposed project. It was noted the investment costs are within the reasonable range, 8.8 mil. KRW/kW as reported by the government-published report on new and renewable energy feed-in tariff and RPS (publishing date: 31 Mar 2006). It is further confirmed that the input values for economic analysis of photovoltaic projects in the published report is still valid by cross-check with the Government Notice No. 2009-96.
- O&M costs: the O&M costs for the proposed project were confirmed by cross-check with the official document prepared by the Gochang County Planning Committee for the approval of the Provincial Government on the proposed project. It is confirmed O&M costs are within the reasonable range, 1% of initial investment costs as reported by the government-published report on new and renewable energy feed-in tariff and RPS (publishing date: 31 Mar 2006). It is further confirmed that the input values for economic analysis of photovoltaic projects in the published report is still valid by cross-check with the Government Notice No. 2009-96.
- Electricity tariff: the electricity price used in NPV calculation, i.e. one-year average electricity price for photovoltaic plants in 2007 was validated by cross-check with data down-loaded at the KPX (Korea Power Exchange) statistics webpage. It was further confirmed that those value are most recently available at the point of the project start.
- Electricity generation: as per EB 48, Annex 11, the plant load factor shall be defined ex-ante in the CDM-PDD according to one of the following three options: (a) The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity for implementation approval; (b) The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company). In line with Paragraph 3(a) of the guidance, the Validation Team verified the plant load factor for the proposed project, 16.9% by cross-checking the official document prepared by the Gochang County Planning Committee for the approval of the Provincial Government on the proposed project.
- Discount rate: The project participant used as a discount rate the 3 year-terms government bond rate in 2006 at the time of investment decision in line with the Additionality Tool. The rate was validated by cross-check with the Korea Central Bank webpage.



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- **Validity of FSR:** the project proponent has not submitted the FSR provided by an engineering company, but, instead the official document prepared by the Gochang County Planning Committee for the approval of the Provincial Government on the proposed project. The Validation Team scrutinized the document and found that main elements in light of the feasibility of the proposed project were provided in the report including economic analysis, construction timeline, financing, technical specifications, schematic diagram on the project site, etc. In this regard, the Validation Team is of the opinion that this report is sufficiently representing feasibility of the proposed as a FSR. So, comparing the date of the document, 10 May 2007 with the date of the board decision, 2 Feb 2007, it can be concluded that the period of time between the submission date of the document and the investment decision is sufficiently short such that it is unlikely in the context of the underlying project activity that the input values would have materially changed.

It was further validated that the sensitivity analysis for the project activity was properly carried out considering both negative and positive variations in major variables such as total investment costs, O&M cost, and electricity tariff. Results of the sensitivity analysis were confirmed by assessing the appropriateness of the assumed variations in the cash flow and noting that the NPV remains below zero under the favorable conditions assumed.

Regarding the starting date of the project activity, one CAR was raised and closed out as follows;

- **CAR5:** According to the “Glossary of CDM terms (ver03), the starting date of the project activity shall be the earliest among the dates when construction, implementation, and real action begins. In this regard, the starting date is not clear and should be evidenced, for example, by the Equipment Purchase Contract. (see Appendix B. Checklist C.1.1);
 - **Corrective Action:** The starting date is corrected into the date when the equipment purchase agreement was signed.
 - **Conclusions:** The starting date of the project, 28/June/2007 was verified by cross-checking the purchase agreement for solar modules. It is thus conclude that the starting date is properly evidenced.

Regarding the prior consideration of CDM benefits, one CAR was raised;

- **CAR6:** As the start date of the project activity is prior to the date of publication of the PDD, the PP must demonstrate that the incentive from the CDM was seriously considered in the decision to implement the project activity. So, the evidence to support such consideration must be adequately and transparently described in the PDD according to the guidance by EB41, Annex 46 C. (see Appendix B. Checklist B.5.2);
 - **Corrective Actions:** The minutes of the Board Meeting are submitted to demonstrate serious consideration of CDM benefits before the start date of the project activity. In addition, continuing and real actions since the investment decision for the project activity are provided.



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- **Conclusions:** Prior consideration of CDM benefits, and continuing and real actions since the investment decision for the project activity are sufficiently substantiated.

With regards to NPV calculations, the Project Proponent submitted to DOE the Project Implementation Plan. But, this document does not include detailed information in terms of investment costs, and estimation of electricity generation. In addition, the date of its publication is not so clear that the Validation Team can not assess the period of time between the finalization of the (Feasibility Study Report) FSR and the investment decision is sufficiently short for the DOE to confirm that it is unlikely in the context of the underlying project activity that the input values would have materially changed. So, one CAR was raised;

- **CAR7:** The date and validity of FSR are not substantiated by objective evidences. So, the Validation Team can not validate that the key parameters used in the investment analysis are based on the FSR and actually reflected at the time of investment decision in the context of the project activity. (see Appendix B. Checklist B.5.10);
- **Corrective Actions:** The project proponent submitted the official document prepared by the Gochang County Planning Committee for the approval of the Provincial Government on the proposed project to evidence key parameters used in the investment analysis.
- **Conclusions:** the project proponent has not submitted the FSR provided by an engineering company, but, instead the official document prepared by the Gochang County Planning Committee for the approval of the Provincial Government on the proposed project. The Validation Team scrutinized the document and found that main elements in light of the feasibility of the proposed project were provided in the report including economic analysis, construction timeline, financing, technical specifications, schematic diagram on the project site, etc. In this regard, the Validation Team is of the opinion that this report is sufficiently representing feasibility of the proposed as a FSR. It is thus concluded that evidences on key parameters used in the investment analysis are provided.

3.4 Monitoring Plan

The monitoring plan for the project activity is established pursuant to the “Simplified Modalities and Procedures for small scale CDM project activities” AMS I.D (version 13) and “Tool to calculate the emission factor for an electricity system (ver 01).”

The combined margin emission factor (CM) is determined ex-ante based on the most recently available information. Hence, electricity supplied to the grid only will be monitored.

The net electricity generated from the project will be measured on an hourly basis and recorded on a monthly basis. This data will be cross verified against the sales receipt from the grid.

The monitoring and QA/QC procedures including responsibilities and authorities for project management, calibration of metering equipment, double-check of key monitoring indicators are provided in the PDD. Detailed procedures will be implemented at the latest prior to the start of the crediting period to enable subsequent verification of emission reductions.



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Two CARs regarding the monitoring plan were raised and closed out as follows;

- **CAR8:** Measurement methods of net electricity generation are described wrong in the monitoring plan. (see Appendix B. Checklist B.7.2);
 - **Corrective Actions:** Measurement methods for metering net electricity supplied to the grid are described correctly in the monitoring plan.
 - **Conclusions:** The request for corrective actions is closed out.

- **CAR9:** Separate meters will be installed to meter auxiliary consumption. But, this method is described wrong. (see Appendix B. Checklist B.7.3);
 - **Corrective Actions:** Net electricity supplied to the grid will be measured excluding the auxiliary electricity consumption of the photovoltaic plant. In advance, the Measurement will be in compliance with the National Guidelines and requirement of the KPX (Korea Power Exchange) for accuracy and reliability.
 - **Conclusions:** Measurement of the auxiliary electricity consumption of the proposed project is sufficiently addressed.

3.5 Calculation of GHG Emissions

The emission reduction ER_y by the project during the crediting period is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (Ly).

1) Baseline emissions: Baseline emissions (BE_y in tCO_2) are the product of the baseline emission factor (EF_y in tCO_2/MWh) times the electricity supplied by the project to the grid (EG_y in MWh).

2) Project emissions: There are no emissions from the project in accordance with AMS I.D. version 13.

3) Leakage: There is no need to consider these emission sources as leakage in accordance with AMS I.D. version 13.

4) Emission reduction: $ER_y = BE_y - PE_y - Ly = BE_y - 0 - 0 = BE_y$

The baseline emission factor for the project is determined ex-ante as a combined margin, consisting of combination of the operating margin (OM) and build margin (BM).

For the calculation of the OM, the Simple OM emission factor calculation method is selected because low cost/must run resources constitute less than 50% of the total grid generation in average of the five most recent years and data is not available for applying the dispatch data analysis.

The electricity generation and fuel consumption data by plants are used quoting from Korea Electric Power Statistics published by KEPCO (Korea Electric Power Corporation). Country specific data for net calorific value (NCVi) of each plant and the IPCC 2006 default value of carbon emission factor of each type of fossil fuel are also used in calculating baseline emission factors. Three-year data from 2005 to 2007 are used for operating margin calculation. The OM is calculated to be $0.6817 tCO_2/MWh$ as a generation-weighted average for the consecutive three



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years. The BM is calculated to be 0.3933 tCO₂/MWh. Given that the weighting factors, w_{OM} and w_{BM} are selected as 0.75 and 0.25, respectively, as stipulated by Tool to calculate the emission factor for an electricity system (ver 01). The combined margin of 0.6096 tCO₂/MWh is fixed ex-ante for the crediting period. The GHG calculations are complete and transparent, and their accuracy has been verified. It is further confirmed that the national grid data used are most recently available at the point of the commencement of validation.

With regards to emission reduction calculations, two CARs and one CL were raised and then closed out as follows;

- **CAR10:** The CO₂ emission factors by fuels should be used consistently between Excel spreadsheets and the PDD. (see Appendix B. Checklist B.6.4);
 - **Corrective Actions:** The CO₂ emissions factors by fuels are corrected in the PDD and therefore consistently used between excel spreadsheets and the PDD.
 - **Conclusions:** It is confirmed that the CO₂ emissions factors by fuels are consistently used between excel spreadsheets and the PDD.
- **CAR11:** Fuel consumption of Honam #1 is described wrong. (see Appendix B. Checklist B.6.4);
 - **Corrective Actions:** Fuel consumption of Honam #1 is corrected.
 - **Conclusions:** The request for corrective actions against this CAR is closed out.
- **CL1:** all assumptions and data used by the project participants are appropriately presented in the PDD. But, contents of Table B-6 are Missing (see Appendix B. Checklist B.6.1);
 - **Corrective Actions:** Table B-6, "Parameter of Emission Factor & Baseline Emission" is provided.
 - **Conclusions:** The request for corrective actions against this CAR is closed out.

3.6 Environmental Impacts

As for its environmental impacts on the local area, in accordance with the environmental legislation in the host country, Pre-Environmental Review was performed for land developments and the potential environmental impacts have been sufficiently identified. No significant environmental impacts are expected from the project.

3.7 Comments by Local Stakeholders

The project participant held the local stakeholder's meeting at the Heungduk-Myun office in Gochang April 25, 2007. The participants in the meeting includes residents near the project site, the Chair and vice-Chair of Gochang-Gun Assembly, staff of Gochang Solarpark Co. Ltd,



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technical experts on civil engineering and environmental engineering. The minute for this meeting was submitted, and reviewed by the Validation Team.

With regards to receipt of comments from local stakeholders, one CL was raised and then closed out as follows;

- **CL2:** Details of what comments were received at the stakeholders' meeting are not provided in Section E.2. Checklist E.2.2);
 - **Corrective Actions:** Details about the meeting are described in Section E.2 as follows: At the meeting they discussed about environmental impacts by the project activity and invited local residents' comments on the draft report on environmental impacts. There are no comments received at the meeting.
 - **Conclusions:** The revised PDD sufficiently explains what comments were received at the stakeholders' meeting.

4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

In accordance with Paragraph 40(c) of the CDM Modalities and Procedures, the project design document of the "Gochang Solarpark 14.98MW Photovoltaic Power Plant Project" had been posted on the UNFCCC CDM website for public comments and Parties, stakeholders and NGOs were through CDM website invited to provide comments during 30 days period from 29 Jan 09 to 27 Feb 09. No comments were received during this period.

5 VALIDATION OPINION

KEMCO has undertaken the validation of Gochang Solarpark 14.98MW Photovoltaic Power Plant Project which claimed approximately 13,523 CO₂eq ton annually by generating electricity utilizing solar radiation. To ensure the transparency and integrity of the validation, the Validation Team first had established the validation protocol taking into account UNFCCC, Kyoto Protocol, Marrakesh Accords, Decision 3, 4/CMP.1 and relevant decisions of the CDM executive board. Based on the checklist the validation of the project activity was undertaken in three stages, i.e. desk review, on-site assessment and follow-up interviews, and review of corrective actions.

As a result of the desk review and on-site assessment, the validation team identified eleven Corrective Action Requests (CARs) and two Clarification Requests (CLRs) and then requested the project proponents to take corrective actions against them. In response to the request, the project proponents submitted the revised project documentation to the Validation Team, of which the Validation Team made a full review. Then the team has fully agreed that all the significant CARs and CLs issued had been cleared.

In conclusion, KEMCO is of the opinion that [Gochang Solarpark 14.98MW Photovoltaic Power Plant Project] is in full compliance with all applicable requirements for the CDM by leading to emission reductions additional to what would have otherwise occurred, providing for reliable and measurable emission reductions with the well-established monitoring plan and contributing to sustainable development in Korea through improvement of environmental condition, resource exploration and conservation, and socio-economic benefits.



6 REFERENCES

Category 1: Documents and electronic files submitted by the Project Participants

- /1/ Project Design Document (version 07), Updated in 4 Jan 20010
- /2/ Baseline Emission Factor (version 03), Excel Spreadsheets, submitted on 14 Sep 2009
- /3/ Investment Analysis (version 02), Excel Spreadsheets, submitted on 14 Sep 2009
- /4/ Decision on the Management Plan of Gochang County, Gochang County Planning Committee, 10 May 2007
- /5/ Minutes of Board Meeting, Board of Directors of Gochang SolarPark Co., Ltd., 2 February 2007
- /6/ Equipment Purchase Contract, Gochang SolarPark Co., Ltd. and SolarWorld Asia Pacific Pte Ltd., 28 June 2007
- /7/ Loan Agreement for Gochang Photovoltaic Power Project, Kookmin Bank, 3 January 2008
- /8/ License for Power Generation Business, Ministry of Commerce, Industry, and Economy, 29 June 2007
- /9/ Approval of CDM Project(No. 2009-12), Ministry of Knowledge Economy, 19 Aug 2009
- /10/ Economic Statistics System, Bank of Korea, <http://ecos.bok.or.kr/>
- /11/ Electric Power Statistics Information System, Korea Power Exchange, <http://epsis.kpx.or.kr/>

Category 2: Documents and websites referred to by KEMCO

- /12/ Clean Development Mechanism Validation and Verification Manual (Version01)
- /13/ AMS-I.D. Grid connected renewable electricity generation (Version 13)
- /14/ Tool to calculate the emission factor for an electricity system (Version 01)
- /15/ <http://cdm.unfccc.int/DNA/index.html>
- /16/ Korea Electric Power Statistics 2005-2007
- /17/ Report on Feed-in Tariff for New and Renewable Energy and RPS, Ministry of Knowledge Economy, 31 March 2006
- /18/ 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Persons interviewed:



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List persons interviewed during the validation, or persons contributed with other information that are not included in the documents listed above.

Gochang SolarPark Co., Ltd.

Mr. Jang, Sung-Uk

Ecoeye Co., Ltd.

Mr. Park, Jung-Ha, Mr. Bae, Won-Tak

Local government officers

Mr. Shin, Hak Jun (Regional Economy Department, Gochang County)

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Appendix A

Validation Protocol

 VALIDATION REPORT

Table 1. Mandatory Requirements for Clean Development Mechanism (CDM) Project Activities

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	Checked	Table 2, Section A.4
2. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof	Kyoto Protocol Art. 12.2, Marrakesh Accords, CDM Modalities §40a	Checked	Table 2, Section A.3 LoA by DNA of Korea has been received.
3. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC	Kyoto Protocol Art.12.2.	Checked	Table 2, Section A.4
4. The project shall have the written approval of voluntary participation from the designated national authorities of each party involved	Kyoto Protocol Art. 12.5a, Marrakesh Accords, CDM Modalities §40a	Checked	The LoAs from Korea have been received.
5. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change	Kyoto Protocol Art. 12.5b	Checked	Table 2, Section B.6
6. Reduction in GHG emissions shall be additional to any that would occur in absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity	Kyoto Protocol Art. 12.5c, Marrakesh Accords, CDM Modalities §43	Checked	Table 2, Section B.5
7. Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance	Marrakech Accords	Checked	The validation did not reveal any information that indicates that the project can be seen as a diversion of ODA

VALIDATION REPORT


REQUIREMENT	REFERENCE	CONCLUSION	Cross Reference / Comment
			funding towards Korea.
8. Parties participating in the CDM shall designate a national authority for the CDM	Marrakech Accords, CDM Modalities §29	Checked	The DNA of Korea is the Prime Minister's Office.
9. The host country shall be a Party to the Kyoto Protocol	Marrakech Accords, CDM Modalities §30	Checked	Korea ratified the KP on 8 Nov 2002.
10. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received	Marrakech Accords, CDM Modalities §37b	Checked	Table 2, Section E
11. Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, shall be submitted, and, if those impacts are considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out.	Marrakech Accords, CDM Modalities §37c	Checked	Table 2, Section D
12. Baseline and monitoring methodology shall be previously approved by the CDM Methodology Panel	Marrakech Accords, CDM Modalities §37e	Checked	Table 2, Section B.1.1 and B.7.1
13. 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	Marrakech Accords, CDM Modalities §37f	Checked	Table 2, Section B.7
14. Parties, stakeholders and UNFCCC accredited NGOs shall have been invited to comment on the validation requirements for minimum 30 days, and the project design document and comments have been made publicly available	Marrakech Accords, CDM Modalities, §40	Checked	The PDD of the project had been posted on the UNFCCC CDM website for public comments and

 VALIDATION REPORT


REQUIREMENT	REFERENCE	CONCLUSION	Cross Reference / Comment
			Parties, stakeholders and NGOs were through CDM website invited to provide comments from 29 Jan 2009 to 27 Feb 2009 (30days).
15. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances	Marrakech Accords, CDM Modalities, §45c,d	Checked	Table 2, Section B.4
16. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure	Marrakech Accords, CDM Modalities, §47	Checked	Table 2, Section B.4
17. The project design document shall be in conformance with the UNFCCC CDM-PDD format	Marrakech Accords, CDM Modalities, Appendix B, EB Decisions	Checked	The PDD is in line with UNFCCC CDM-PDD format. Table2, Section A.1.1

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Table 2. Requirements Checklist

 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
A. General Description of Project Activity <i>In this section, the project design is assessed including the project purpose, how technology will be transferred and whether public funding from Annex I Parties results in a diversion of official development assistance.</i>						
A.1. Project Design Document <i>Note:</i>						
A.1.1.	Is the Project Design Document (PDD) in accordance with the latest template and guidance from the CDM Executive Board available on the UNFCCC CDM website?	/1/	Document Review	1. Checked: The PDD is in accordance with the latest template (version 03) and guidance published by the CDM EB.	OK	
A.2. Description of the project activity <i>Note:</i>						
A.2.1.	Does the description of the proposed CDM project activity provide a clear understanding of the nature of the proposed CDM project activity?	/1/ /4/	Document Review	1. Checked: The proposed project aims to generate electricity with photovoltaic cells utilizing solar radiation energy and feed it into the grid.	OK	
A.2.2.	Does the project contribute to sustainable development of the host country from environmental, social and economic	/1/	Document Review	1. Checked: The proposed project is expected to bring social and environmental benefits including diversification of energy sources and reduction of	OK	


VALIDATION REPORT

 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	perspectives?			GHG emissions to the host country and local areas.		
A.3. Project Participants <i>Note:</i>						
	A.3.1. Are participating Parties including the host country a Party to the Kyoto Protocol?	/1/	Document Review	1. Checked: Korea has designated a national authority for the CDM and ratified the Kyoto Protocol on 8/11/2002.	OK	
	A.3.2. Have the project received the written approval of voluntary participation from the designated national authorities (DNA) of each Party involved, including confirmation by the host Party that the project activity assists it in achieving sustainable development?	/1/ /9/	Document Review	1. To be checked: The project participants have not submitted the written approvals of voluntary participation.	To be checked	OK
	A.3.3. Does each DNA's letter refer to the precise proposed CDM project activity title in the PDD being submitted for registration?	/1/ /9/	Document Review	Ditto		OK
	A.3.4. Have a private and/or public entity participating in the project been authorized by the designated national authorities (DNA) of the Parties?	/1/ /9/	Document Review	Ditto		OK


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 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	A.3.5. Are the project participants listed in tabular form in section A.3 of the PDD consistent with the contact details provided in annex 1 of the PDD?	/1/	Document Review	1. Checked: The project participant is Gochang solarpark Co., Ltd.	OK	
	A.4. Technical description of the project activity <i>Note:</i>					
	A.4.1. Is the location of the project activity clearly described?	/1/	Document Review	1. Checked: The project site is located in 100, Chiryong-Ri, Heungdeuk-Myeun, Gochang-Gun, Jeollabuk-Do, Republic of Korea.	OK	
	A.4.2. Are the type and category and technology/measure of the small-scale project activity clearly identified and described?	/1/	Document Review	1. Checked: This project generates electricity utilizing renewable resources and feed it to grid, thus belongs to the category of AMS I.D.	OK	
	A.4.3. Does the description of the proposed CDM project activity sufficiently cover all relevant elements and provide the technical aspects of its implementation?	/1/	Document Review	1. CAR1: The efficiency of PV cells means the conversion ratio of solar radiation to electricity energy. But, the PDD described the cell efficiency wrong by providing the same value as the load factor, viz. 16.6%. So, the PV cell efficiency should be corrected as evidenced by technical specifications.	CAR	OK
	A.4.4. Does the project design clearly and consistently indicate the chosen crediting period, the total estimation of emission reductions as well as annual estimate for the	/1/	Document Review	1. CAR2: Table A-4 in the PDD presents annual estimation of emission reductions attributable to the project activity. But, the crediting period of Year 10 in the Table is described wrong. 2. CAR3: The starting date of the crediting period is not	CAR	


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 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	chosen crediting period?			described consistently between Table A-4 and Section C.2.1. in the PDD.		
	A.4.5. In case public funding from Annex I Parties is involved, does the project provide an affirmation that such funding does not result in a diversion of official development assistance?	/1/ /7/	Document Review	1. Checked: the Validation Team checked the loan agreement with a bank regarding the proposed project and confirmed that there is no ODA included in the project.	OK	
	A.4.6. If the proposed CDM project activity involves the alteration of an existing installation or process, does the project description clearly state the differences resulting from the project activity compared to the pre-project situation?			Not Applicable	-	
	A.4.7. Has the confirmation been provided that the small-scale project activity is not a debundled component of a larger project activity?	/1/	Document Review Site Visit	1. Checked: During the site visit, it was confirmed that there were no other CDM projects with the same project participant within 1 km of the project boundary.	OK	
	B. Baseline and monitoring methodology <i>In this section it is assessed whether the baseline methodology is appropriately applied in terms of project additionality in a transparent and conservative manner and whether the monitoring plan is properly established in accordance with the baseline methodology ensuring reliable emission reductions</i>					


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 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
B.1. Title and reference of the approved baseline methodology applied to the project activity <i>Note:</i>						
B.1.1.	Are the title and the details (number and version) of the approved baseline and monitoring methodologies in the CDM web site properly referred to?	/1/	Document Review	1. Checked: The proposed project applies the approved methodologies for small scale projects AMS I.D (version 13)	OK	
B.2. Justification of the choice of the project category <i>Note:</i>						
B.2.1.	Has the choice of project type and category for the proposed small-scale project activity been transparently justified?	/1/	Document Review	1. Checked: The project applies the approved methodologies for small scale projects AMS I.D(version 13) since its capacity is less than 15 MW and it provides renewable-based electricity to grid.	OK	
B.2.2.	Does the small-scale project activity qualify as a small-scale project activity and will it remain under the limits of small-scale project activity types during every year of the crediting period?	/1/	Document Review	1. Checked: The capacity of the proposed project is 14.98MW and will not be changed during the crediting period.	OK	


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 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	B.2.3. If not addressed by the applied methodology, do the project proponents appropriately provide such information as greenhouse gas emissions occurring within the proposed CDM project activity boundary as a result of the implementation of the proposed CDM project activity which are expected to contribute more than 1% of the overall expected average annual emissions reductions?			Not Applicable		
	B.3. Description of the project boundary <i>Note:</i>					
	B.3.1. Is the project boundary correctly described and meet the requirements of the selected baseline methodology?	/1/	Document Review	1. Checked: The project boundary established encompasses the physical, geographical site of the proposed project and the connected electricity system in Korea.	OK	
	B.3.2. Have all sources and GHGs required by the methodology been included within the project boundary?	/1/	Document Review	1. Checked: Only CO ₂ emissions are included within the project boundary in line with the baseline methodology.	OK	
	B.3.3. If the methodology allows project participants to choose whether a source or gas is to be included			Not Applicable	-	


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 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	within the project boundary, have the project participants justified that choice?					
	B.4. Details of the baseline and its development <i>Note:</i>					
	B.4.1. Are all scenarios that are considered by the project participants and are supplementary to those required by the methodology, reasonable in the context of the proposed CDM project activity?	/1/	Document Review	1. Checked: The project applies the approved methodology for small scale projects AMS I.D (version 13) since its capacity is less than 15 MW and it provides renewable-based electricity to grid. In line with the methodology, the baseline scenario is set up reasonably, i.e. continued electricity generation by power plants in the existing electricity system.	OK	
	B.4.2. Is the baseline scenario identified reasonable in terms of the assumptions, calculations and rationales used, as described in the PDD?	/1/	Document Review	1. Checked: The baseline scenario of this project is based on the reasonable assumptions that the project will displace the electricity generated by power plants in the existing electricity system.	OK	
	B.4.3. Does the PDD provide verifiable description of the identified baseline scenario, including a description of the technology that would be employed and/or the activities that would take place in the absence of the proposed CDM	/1/	Document Review	1. Checked: verifiable information is provided with respect to the list of power plants that would be in operation in the absence of the proposed project.	OK	


VALIDATION REPORT

 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	project activity?					
	B.4.4. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies and circumstances, such as sectoral reform initiatives, local fuel availability, power sector expansion plans and the economic situation in the project sector?	/1/	Document Review	1. Checked: Descriptions about national policies to promote the use of renewable energy are provided in the PDD. Exclusion of the government subsidy is justified in the PDD as per the Clarifications on the treatment of national and/or sectoral policies and regulations (EB 16).	OK	
	B.4.5. Are all documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the PDD?	/1/	Document Review	1. Checked: the project proponent chose Simple OM method to determine the CO ₂ emission factor for the baseline emissions. The baseline emissions are therefore calculated using three-year grid data including net electricity generation, fuel consumption, and net calorific value, which were published by the electricity distribution company, KEPCO. It was also noted the 2005-2007 grid data is most recently available at the point of validation.	OK	
	B.4.6. Has the approved baseline methodology been correctly applied to identify the most reasonable baseline scenario and does the identified baseline scenario reasonably represent what would occur in the absence of the proposed CDM project activity?	/1/	Document Review	1. CAR4: in line with the Tool to calculate the emission factor for an electricity system (version 01.1), the project proponent chose Simple OM method to determine the CO ₂ emission factor for the baseline emissions. But, data on constitution of low-cost and must-run resources are not most recently available ones.	CAR	OK


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 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	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 <i>Note:</i>					
	B.5.1. For a new project activity with a start date on or after 2 August 2008, for which PDD has not been published for global stakeholder consultation or a new methodology proposed to the Executive Board before the project activity start date, had the Project Participants informed the Host Party DNA and/or the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status?			Not Applicable	-	
	B.5.2. For an existing project activity with a start date before 2 August 2008, for which the start date is prior to the date of publication of the PDD for global stakeholder consultation, has the Project Participant's prior consideration of the CDM been	/1/ /5/	Document Review	1. CAR6: As the start date of the project activity is prior to the date of publication of the PDD, the PP must demonstrate that the incentive from the CDM was seriously considered in the decision to implement the project activity. So, the evidence to support such consideration must be adequately and transparently described in the PDD according to the guidance by	CAR	OK


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 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	sufficiently evidenced?			EB41, Annex 46 C.		
	B.5.3. Does the list of alternatives include as one of the options that the project activity is undertaken without being registered as a proposed CDM project activity?	/1/	Document Review	1. Checked: the investment barriers to proposed project are analyzed assuming that the proposed project is undertaken without being registered as a proposed CDM project activity	OK	
	B.5.4. Does the list of alternatives contain all plausible alternatives considered to be viable means of supplying the outputs or services that are to be supplied by the proposed CDM project activity?	/1/	Document Review	1. Checked: the baseline scenario includes as an alternative, power plants in the existing electricity system under the scenario, the CO ₂ emission factor is accounted for using the Simple OM method and BM option (b). It is therefore concluded that all plausible alternatives supplying the outputs that are to be supplied by the proposed project activity are considered properly.	OK	
	B.5.5. Do the alternatives comply with all applicable and enforced legislation?	/1/	Document Review	1. Checked: all the power plants connected to the grid as well as the proposed project are in compliance with the relevant laws and regulations.	OK	
	B.5.6. (Investment Analysis) Are all parameters and assumptions used in calculating the relevant financial indicator accurate and suitable in light of relevant accounting practices?	/1/ /3/ /4/ /7/ /10/ /11/ /17/	Document Review	1. Checked: It was validated that all parameters and assumptions of the proposed project are accurate and suitable in light of relevant accounting practices as follows: 2. Investment costs: the investment costs for the proposed project were confirmed by cross-check with the official document prepared by the Gochang County Planning Committee for the approval of	OK	


VALIDATION REPORT

 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
				<p>the Provincial Government on the proposed project. The costs were double-checked with the loan agreement with a bank for the proposed project. It was further noted the investment costs are within the reasonable range reported by the government-published report.</p> <ol style="list-style-type: none"> 3. O&M costs: it is confirmed O&M costs are within the reasonable range reported by the government-published report. 4. Electricity tariff: the electricity price used in NPV calculation, i.e. one-year average electricity price for photovoltaic plants in 2007 was validated by cross-check with data down-loaded at the KPX (Korea Power Exchange) statistics webpage. It was further confirmed that those value are most recently available at the point of the project start. 5. Electricity generation: the annual power generation for the proposed project was confirmed by cross-check with the official document prepared by the Gochang County Planning Committee for the approval of the Provincial Government on the proposed project. 6. Discount rate: The project participant used as a discount rate the 3 year-terms government bond rate in 2006 at the time of investment decision in line with the Additionality Tool. The rate was validated by cross-check with the Korea Central Bank webpage. 		


VALIDATION REPORT

 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	B.5.7. (Investment Analysis) Are computations in the investment analysis correctly carried out and sufficiently documented?	/1/ /3/	Document Review	1. Checked: the Validation Team checked the excel spreadsheet submitted by the project proponent and confirmed the computations in determining NPV for the proposed project are correctly carried out and sufficiently documented.	OK	
	B.5.8. (Investment Analysis) Are the sensitivity analysis properly carried considering under what conditions variations in the result of investment analysis would occur, and the likelihood of these conditions?	/1/ /3/	Document Review	1. Checked: It was validated that the sensitivity analysis for the project activity was properly carried out considering both negative and positive variations in major variables such as total investment costs, O&M cost, and electricity tariff. Results of the sensitivity analysis were confirmed by assessing the appropriateness of the assumed variations in the cash flow and noting that the NPV remains below zero under the favorable conditions assumed.	OK	
	B.5.9. (Investment Analysis) Is the type of benchmark applied suitable for the type of financial indicator presented?			Not Applicable	-	


VALIDATION REPORT

 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	B.5.10.(Investment Analysis) Has the Feasibility Study Report (FSR) been the basis of the decision to proceed with the investment in the project? i.e. is the period of time between the finalization of the FSR and the investment decision is sufficiently short and is it unlikely in the context of the underlying project activity that the input values would have materially changed?	/1/ /4/	Document Review	1. CAR7: the date and validity of FSR are not substantiated by objective evidences. So, the Validation Team can not validate that the key parameters used in the investment analysis are based on the FSR and actually reflected at the time of investment decision in the context of the project activity.	CAR	OK
	B.5.11. (Barrier Analysis) Is existence of barriers substantiated by independent sources of data such as relevant national legislation, surveys of local conditions and national or international statistics?			Not Applicable	-	
	B.5.12. (Barrier Analysis) Is a barrier or set of barriers likely to prevent the implementation of the proposed CDM project activity and unlikely to equally prevent implementation of at least one of the possible alternatives, in particular the identified baseline scenario?			Not Applicable	-	


VALIDATION REPORT

 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	B.5.13. (Common Practice Analysis) Is the geographical scope of the common practice analysis appropriate for the assessment of common practice related to the project activity's technology or industry type?			Not Applicable	-	
	B.5.14. (Common Practice Analysis) Is existence of similar projects substantiated by official sources and local and industry expertise?			Not Applicable	-	
	B.5.15. (Common Practice Analysis) Are essential distinctions sufficiently provided between the proposed CDM project activity and any similar projects that are widely observed and commonly carried out?			Not Applicable	-	
B.6. Emissions reductions <i>Note:</i>						
	B.6.1. Are all assumptions and data used by the project participants listed in the PDD, including their references and sources?	/1/ /2/ /16/	Document Review	1. CL1: all assumptions and data used by the project participants are appropriately presented in the PDD. But, the contents of table B-6 are missing.	CL	OK


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 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	B.6.2. Is all documentation used by project participants as the basis for assumptions and source of data correctly quoted and interpreted in the PDD?	/1/ /2/ /16/	Document Review	1. Checked: The PDD described appropriately data sources, e.g, KEPCO grid data, IPCC default emission factor, and KPX electricity tariff.	OK	
	B.6.3. Are all values used in the PDD considered reasonable in the context of the proposed CDM project activity?	/1/ /2/ /16/	Document Review	1. Checked: The national grid data used are most recently available at the point of the commencement of validation.	OK	
	B.6.4. Has been the baseline methodology been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions?	/1/ /2/ /16/	Document Review	1. CAR 10: The CO ₂ emission factors by fuels should be used consistently between Excel spreadsheets and the PDD. 2. CAR 11: Fuel consumption of Honam #1 is described wrong.	CAR	OK
	B.6.5. Can all estimates of the baseline emissions be replicated using the data and parameter values provided in the PDD?	/1/ /2/ /16/	Document Review	1. Checked: the Validation Team checked the excel spreadsheets to calculate the baseline emissions and concluded that the process to calculate the baseline emissions are replicable.	OK	
	B.7. Application of the monitoring methodology and description of the monitoring plan <i>Note:</i>					
	B.7.1. Does the monitoring plan contain all necessary parameters and the means of monitoring described in the plan comply with the	/1/	Document Review	1. Checked: net electricity generation by the proposed project will be monitoring plan in line with the requirements of AMS I.D. (version 13)	OK	


VALIDATION REPORT

 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	requirements of the methodology?					
	B.7.2. Are monitoring arrangements described in the monitoring plan feasible within the project design?	/1/	Document Review Site Visit	1. CAR8: Measurement methods of net electricity generation are described wrong in the monitoring plan.	CAR	OK
	B.7.3. Are procedures for monitoring, taking measurements and reporting sufficient to ensure the accuracy and completeness of emission reductions achieved by the proposed CDM project activity?	/1/	Document Review Site Visit	1. Checked: The monitoring and reporting procedures are sufficient to ensure the accuracy and completeness of emission reductions. 2. CAR9: Separate meters will be installed to meter auxiliary consumption. But, this method is described wrong.	CAR	OK
	B.7.4. Are procedures for emergency preparedness appropriately established?	/1/	Document Review	1. Checked: The amount of net electricity generation will be collected daily, weekly, and monthly, archived in electronic way, and double-checked with the receipt of sales.	OK	
	B.7.5. Are procedures for calibration of equipment appropriately established?	/1/	Document Review	1. Checked: The calibration of the metering equipment will be done pursuant to the relevant regulations.	OK	
	B.7.6. Are procedures for review or checks of reported results/data appropriately established?	/1/	Document Review	1. Checked: The amount of net electricity generation will be collected daily, weekly, and monthly, archived in electronic way, and double-checked with the receipt of sales.	OK	
	B.7.7. Is the authority and responsibility for monitoring, measurement and reporting project emission, baseline emission and leakage	/1/	Document Review	1. Checked: The operational and management structure for monitoring is described in Section B.7.2 of PDD.	OK	


VALIDATION REPORT

 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	data over time clearly described?					
	B.8. Details of baseline information, including the date of completion of the baseline study and the name of person(s)/entity(ies) determining the baseline <i>Note:</i>					
	B.8.1. Is the detailed baseline information sufficiently provided in Annex 3 to the PDD?	/1/	Document Review	1. Checked: the detailed baseline information is provided in Annex 3 to the PDD.	OK	
	B.8.2. Are the date of completion of the baseline study and the name of person(s)/entity(ies) determining the baseline clearly stated?	/1/	Document Review	1. Checked: the date of completion of the baseline study and the name of persons and entity determining the baseline are clearly stated in Section B.8 of the PDD	OK	
	B.8.3. Is the contact information clearly provided and is it indicated that the person/entity is a project participant listed in Annex I?	/1/	Document Review	1. Checked: The contact information on the entity determining the baseline is clearly provided in Annex 1 to the PDD.	OK	
	C. Duration of the Project/ Crediting Period <i>It is assessed whether the temporal boundaries of the project are clearly defined.</i>					
	C.1. Duration of the project activity <i>Note:</i>					


VALIDATION REPORT

 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	C.1.1. Is the start date of the project activity, reported in the PDD, in accordance with the “Glossary of CDM terms” and sufficiently evidenced?	/1/ /6/	Document Review	1. CAR5: According to the “Glossary of CDM terms (ver03), the starting date of the project activity shall be the earliest among the dates when construction, implementation, and real action begins. In this regard, the starting date is not clear and should be evidenced, for example, by the Equipment Purchase Contract.	CAR	OK
	C.1.2. Is the operational lifetime of the project activity clearly defined and reasonable?	/1/	Document Review	1. Checked: The operational lifetime of the project is assumed to be 20 years.	OK	
	C.2. Choice of the crediting period and related information <i>Note:</i>					
	C.2.1. Is the assumed crediting time clearly defined and reasonable (renewable crediting period of max. two times 7 years or fixed crediting period of max. 10 years)?	/1/	Document Review	1. Checked: The crediting period for the proposed project activity is fixed into 10 years.	OK	
	C.2.2. Is the assumed crediting time chosen as below the operational lifetime of the project activity?	/1/	Document Review	1. Checked: The crediting period chosen is below the operational lifetime of the proposed project activity.	OK	
	C.2.3. Are the starting date and length of the crediting period clearly and properly stated?	/1/	Document Review	1. CAR3: The starting date of the crediting period is not described consistently between Table A-4 and Section C.2.1. in the PDD.	CAR	


VALIDATION REPORT

 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
D. Environmental Impacts <i>In this section, it is assessed the analysis of the environmental impacts is properly undertaken.</i>						
D.1.If required by the host Party, documentation on the analysis of the environmental impacts of the project activity <i>Note:</i>						
D.1.1. Does the project comply with environmental legislation in the host country?		/1/	Document Review	1. Checked: Before the project implementation, PERS (Pre Environmental Review System) was performed.	OK	
D.1.2. Is the project activity likely to create any adverse environmental effects?		/1/	Document Review	1. Checked: Because the proposed project utilizes renewable resources, there are not adverse environmental effects.	OK	
D.1.3. Have the environmental impacts identified been properly addressed in the PDD?		/1/	Document Review	1. Checked: See Question D.1.2 above.	OK	

VALIDATION REPORT

 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
E. Stakeholder Comments <i>In this section, it is assessed whether comments from local stakeholders have been invited and due account has been taken of any comments received.</i>						
E.1. Brief description how comments by local stakeholders have been invited and compiled <i>Note:</i>						
E.1.1.	Is the process clearly described by which comments by local stakeholders have been invited and compiled?	/1/	Document Review Interview	1. Checked: The stakeholder’s meeting was held at the Heungduk-Myun office in Gochang on April 25, 2007.	OK	
E.1.2.	Has an invitation for comments by local stakeholders made in an open transparent manner, in a way that facilitates comments to be received from local stakeholders and allow for a reasonable time for comments to be submitted?	/1/	Document Review Interview	1. Checked: The draft report on environmental impacts by the project activity was made open to the public during three weeks and then comments by local stakeholders were invited at the stakeholder’s meeting.	OK	
E.1.3.	Has detailed description of the project activity been provided in a manner which allows the local stakeholders to understand project activity?	/1/	Document Review Interview	1. Checked: See Question E.1.2 above.	OK	

VALIDATION REPORT

 KEMCO	Small Scale Projects Validation Checklist	Ref.	MoV	Comments	Draft Concl.	Final Concl.
E.2. Summary of the comments received <i>Note:</i>						
E.2.1. Have relevant stakeholders been consulted?		/1/	Document Review Interview	1. Checked: the participants in the meeting include residents near the project site, the Chair and vice-Chair of Gochang-Gun assembly, staff of the Gochang solarpark Co. Ltd, and experts on the public environmental works.	OK	
E.2.2. Is a summary of the comments received provided?		/1/	Document Review Interview	1. CL2: Details of what comments were received at the stakeholders' meeting are not provided in Section E.2.	CL	OK
E.3. Report on how due account was taken of any comments received <i>Note:</i>						
E.3.1. Has due account been taken of any comments received?		/1/	Document Review Interview	1. Checked: As there are no negative comments, no actions are taken.	OK	

 VALIDATION REPORT

Table 3. Resolution of Corrective Action and Clarification Requests

Non-conformities	Reference	Corrective Actions	Comments
1. CAR1: The efficiency of PV cells means the conversion ratio of solar radiation to electricity energy. But, the PDD described the cell efficiency wrong by providing the same value as the load factor, viz. 16.6%. So, the PV cell efficiency should be corrected as evidenced by technical specifications.	Table 2. Section A.4.3	15% of PV cell efficiency is provided in the Table A-3, Technology Description of the PDD.	It is confirmed that the information on PV cell efficiency is appropriately provided. The corrected value of PV cell efficiency, 15% is also deemed reasonable based on the validation Team's sector-specific expertise.
2. CAR2: Table A-4 in the PDD presents annual estimation of emission reductions attributable to the project activity. But, the crediting period of Year 10 in the Table is described wrong.	Table 2. Section A.4.4	The crediting period for emission reductions is corrected.	Request for corrective actions is closed out.
3. CAR3: The starting date of the crediting period is not described consistently between Table A-4 and Section C.2.1. in the PDD.	Table 2. Section A.4.4	The starting date of the first crediting period is corrected consistently with Table A-4 and Table B-7.	Request for corrective actions is closed out.
4. CAR4: in line with the Tool to calculate the emission factor for an electricity system (version 01.1), the project proponent chose Simple OM method to determine the CO ₂ emission factor for the baseline emissions. But, data on constitution of low-cost and must-run resources are not most recently available ones.	Table 2. Section A.4.6	Electricity generations by sources for the most recent five years are provided to justify the selection of Simple OM.	The selection of Simple OM is sufficiently justified.

VALIDATION REPORT

Non-conformities	Reference	Corrective Actions	Comments
5. CAR5: According to the “Glossary of CDM terms (ver03), the starting date of the project activity shall be the earliest among the dates when construction, implementation, and real action begins. In this regard, the starting date is not clear and should be evidenced, for example, by the Equipment Purchase Contract.	Table 2. Section C.1.1	The starting date is corrected into the date when the equipment purchase agreement was signed.	The starting date of the project, 28/June/2007 was verified by cross-checking the purchase agreement for solar modules. It is thus conclude that the starting date is properly evidenced.
6. CAR6: As the start date of the project activity is prior to the date of publication of the PDD, the PP must demonstrate that the incentive from the CDM was seriously considered in the decision to implement the project activity. So, the evidence to support such consideration must be adequately and transparently described in the PDD according to the guidance by EB41, Annex 46 C.	Table 2. Section C.2.1	The minutes of the Board Meeting are submitted to demonstrate serious consideration of CDM benefits before the start date of the project activity. In addition, continuing and real actions since the investment decision for the project activity are provided.	Prior consideration of CDM benefits and continuing and real actions since the investment decision for the project activity are sufficiently substantiated.
7. CAR7: The date and validity of FSR are not substantiated by objective evidences. So, the Validation Team can not validate that the key parameters used in the investment analysis are based on the FSR and actually reflected at the time of investment decision in the context of the project activity.	Table 2. Section B.5.10	The project proponent submitted the official document prepared by the Gochang County Planning Committee for the approval of the Provincial Government on the proposed project to evidence key parameters used in the investment analysis.	The project proponent has not submitted the FSR provided by an engineering company, but, instead the official document prepared by the Gochang County Planning Committee for the approval of the Provincial Government on the proposed project. The Validation Team scrutinized the document and found that main elements in light of the feasibility of the proposed project were provided in the report

VALIDATION REPORT

Non-conformities	Reference	Corrective Actions	Comments
			including economic analysis, construction timeline, financing, technical specifications, schematic diagram on the project site, etc. In this regard, the Validation Team is of the opinion that this report is sufficiently representing feasibility of the proposed as a FSR. It is thus concluded that evidences on key parameters used in the investment analysis are provided.
8. CAR8: Measurement methods of net electricity generation are described wrong in the monitoring plan.	Table 2. Section B.7.2	Measurement methods for metering net electricity supplied to the grid are described correctly in the monitoring plan.	Request for corrective actions is closed out.
9. CAR9: Separate meters will be installed to meter auxiliary consumption. But, this method is described wrong.	Table 2. Section B.7.3	Net electricity supplied to the grid will be measured excluding the auxiliary electricity consumption of the photovoltaic system. In advance, the Measurement will be in compliance with the National Guidelines and requirement of the KPX (Korea Power Exchange) for accuracy and reliability.	Measurement of the auxiliary electricity consumption of the proposed project are sufficiently addressed.
10. CAR 10: The CO ₂ emission factors by fuels should be used consistently between Excel spreadsheets and the PDD.	Table 2. Section B.6.4	The CO ₂ emissions factors by fuels are corrected in the PDD and therefore consistently used between excel spreadsheets and the PDD.	Request for corrective actions is closed out.

 VALIDATION REPORT

Non-conformities	Reference	Corrective Actions	Comments
11. CAR 11: Fuel consumption of Honam #1 is described wrong.	Table 2. Section B.6.4	Fuel consumption of Hanam #1 is corrected.	Request for corrective actions is closed out.
12. CL1: all assumptions and data used by the project participants are appropriately presented in the PDD. But, the contents of table B-6 are missing.	Table 2. Section B.6.1	Table B-6, "Parameter of Emission Factor & Baseline Emission" are provided	Request for corrective actions is closed out.
13. CL2: Details of what comments were received at the stakeholders' meeting are not provided in Section E.2.	Table 2. Section E.2.2	Details about the meeting are described in Section E.2 as follows: At the meeting they discussed about environmental impacts by the project activity and invited local residents' comments on the draft report on environmental impacts. There are no comments received at the meeting.	The revised PDD sufficiently explains what comments were received at the stakeholders' meeting.




Appendix B

CVs of Validation Team




 VALIDATION REPORT

 KEMCO	<h2>Personal History</h2>		
Family name	Park	Date of Birth	27/01/1968
Given name	Kyung-Soon	Sex	Male
Organization	KEMCO	Phone No.	+82-31-260-4885
Position	Associate Manager	Fax No.	+82-31-260-4886
Address	1157, Pungdukchun-2-dong, Yongin, Gyeonggi, 448-994, Republic of Korea		E-mail kspark@kemco.or.kr
Proposed Title	Title		Qualification
	<input type="checkbox"/> Full-time Validator/verifier		<input checked="" type="checkbox"/>
	<input type="checkbox"/> Part-time Validator/verifier		<input type="checkbox"/>
	<input checked="" type="checkbox"/> Full-time Lead Validator/verifier		<input type="checkbox"/>
	<input checked="" type="checkbox"/> KEMC-B-1100, Paragraph 6.2(1) <input type="checkbox"/> KEMC-B-1100, Paragraph 6.2(2) * Please tick off (☑) for qualification as a lead auditor		
	<input type="checkbox"/> Part-time Lead Validator/verifier		<input type="checkbox"/>
	<input type="checkbox"/> Committee Member()		<input type="checkbox"/>
	<input type="checkbox"/> Technical Expert		<input type="checkbox"/>
<input type="checkbox"/> Others ()		<input type="checkbox"/>	
Proposed Sectoral Scope	Sectoral Scope		Qualification
	<input checked="" type="checkbox"/> 1. Energy industries (renewable - / non-renewable sources)		<input checked="" type="checkbox"/>
	<input type="checkbox"/> 2. Energy distribution		<input type="checkbox"/>
	<input checked="" type="checkbox"/> 3. Energy demand		<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/> 4. Manufacturing industries		<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/> 5. Chemical industries		<input checked="" type="checkbox"/>
	<input type="checkbox"/> 6. Construction		<input type="checkbox"/>
	<input type="checkbox"/> 7. Transport		<input type="checkbox"/>
	<input type="checkbox"/> 8. Mining/mineral production		<input type="checkbox"/>
	<input type="checkbox"/> 9. Metal production		<input type="checkbox"/>
	<input type="checkbox"/> 10. Fugitive emissions from fuels (solid, oil and gas)		<input type="checkbox"/>
	<input type="checkbox"/> 11. Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride		<input type="checkbox"/>
	<input type="checkbox"/> 12. Solvent use		<input type="checkbox"/>
	<input type="checkbox"/> 13. Waste handling and disposal		<input type="checkbox"/>
	<input type="checkbox"/> 14. Afforestation and reforestation		<input type="checkbox"/>
<input type="checkbox"/> 15. Agriculture		<input type="checkbox"/>	



 VALIDATION REPORT

 KEMCO	<h2>Personal History</h2>		
Family name	HAN	Date of Birth	23/06/1971
Given name	Seung-Ho	Sex	Male
Organization	KEMCO	Phone No.	+82-31-260-4883
Position	Assistant Manager	Fax No.	+82-31-260-4886
Address	1157, Pungdukchun 2, Suji, Yongin, Gyeonggi, 448-994, Republic of Korea	E-mail	shhan@kemco.or.kr
Proposed Title	Title		Qualification
	<input type="checkbox"/> Full-time Validator/verifier		<input type="checkbox"/>
	<input type="checkbox"/> Part-time Validator/verifier		<input type="checkbox"/>
	<input checked="" type="checkbox"/> Full-time Lead Validator/verifier		<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/> KEMC-B-1100, Paragraph 6.2(1)		
	<input type="checkbox"/> KEMC-B-1100, Paragraph 6.2(2)		
	* Please tick off (<input checked="" type="checkbox"/>) for qualification as a lead auditor		
	<input type="checkbox"/> Part-time Lead Validator/verifier		<input type="checkbox"/>
Proposed Sectoral Scope	Sectoral Scope		Qualification
	<input checked="" type="checkbox"/> 1. Energy industries (renewable - / non-renewable sources)		<input checked="" type="checkbox"/>
	<input type="checkbox"/> 2. Energy distribution		<input type="checkbox"/>
	<input type="checkbox"/> 3. Energy demand		<input type="checkbox"/>
	<input type="checkbox"/> 4. Manufacturing industries		<input type="checkbox"/>
	<input type="checkbox"/> 5. Chemical industries		<input type="checkbox"/>
	<input type="checkbox"/> 6. Construction		<input type="checkbox"/>
	<input type="checkbox"/> 7. Transport		<input type="checkbox"/>
	<input type="checkbox"/> 8. Mining/mineral production		<input type="checkbox"/>
	<input type="checkbox"/> 9. Metal production		<input type="checkbox"/>
	<input type="checkbox"/> 10. Fugitive emissions from fuels (solid, oil and gas)		<input type="checkbox"/>
	<input type="checkbox"/> 11. Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride		<input type="checkbox"/>
	<input type="checkbox"/> 12. Solvent use		<input type="checkbox"/>
	<input type="checkbox"/> 13. Waste handling and disposal		<input type="checkbox"/>
	<input checked="" type="checkbox"/> 14. Afforestation and reforestation		<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/> 15. Agriculture		<input checked="" type="checkbox"/>