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## **VALIDATION REPORT (rev.04.1)**

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**'Bundled Hadong-Busan Photovoltaic Power Plant Project of  
the Korea Southern Power Corporation (1 MW Hadong  
Photovoltaic Power + 0.39 MW Busan Photovoltaic Power,  
Bundling Project)" in KOREA**

**REPORT No. : 2009-05**

**KSA** KOREAN  
STANDARDS  
ASSOCIATION

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## ABBREVIATIONS

<b>BM</b>	Build Margin
<b>CAR</b>	Corrective Action Request
<b>CDM</b>	Clean Development Mechanism
<b>CEF</b>	Carbon Emission Factor
<b>CER</b>	Certified Emission Reduction(s)
<b>CL</b>	Clarification Request
<b>CO<sub>2</sub></b>	Carbon dioxide
<b>CO<sub>2e</sub></b>	Carbon dioxide equivalent
<b>DNA</b>	Designated National Authority
<b>DOE</b>	Designated Operational Entity
<b>GHG</b>	Greenhouse gas(es)
<b>GWP</b>	Global Warming Potential
<b>KEPCO</b>	Korea Electric Power Co. Ltd.
<b>KSA</b>	Korean Standards Association
<b>FAR</b>	Forward Action Request
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>LoA</b>	Letter of Approval
<b>MP</b>	Monitoring Plan
<b>MoV</b>	Means of Validation
<b>NGO</b>	Non-Governmental Organization
<b>ODA</b>	Official Development Assistance
<b>OM</b>	Operational Margin
<b>PDD</b>	Project Design Document
<b>UNFCCC</b>	United Nations Framework Convention for Climate Change

## 0. VALIDATION OPINION

Korean Standards Association (KSA) has performed a validation of the "Bundled Hadong-Busan Photovoltaic Power Project of The Korea Southern Power Corporation (1MW Hadong Photovoltaic Power + 0.39 MW Busan Photovoltaic Power, Bundling Project)" in the Republic of Korea. The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism and the host country criteria.

The validation has been performed by document review based on the project design document, follow-up interviews with project stakeholder and resolution of outstanding issues and the issuance of the validation report.

Total emission reductions from the project are estimated to be on the 1,078 tCO<sub>2-eq</sub> per a year over the selected 10 year crediting period without renewal. The emission reduction forecast has been checked and is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

Validation team also confirmed that monitoring and maintenance plans are clearly defined and adequate

In KSA's opinion, the project meets all relevant UNFCCC requirements for CDM, is eligible as category I.D. small-scale CDM project activity, and correctly applies the approved simplified baseline and monitoring methodology AMS-I.D. (version 15). Hence, KSA requests the registration of the project "Bundled Hadong-Busan Photovoltaic Power Project of the Korea Southern Power Corporation (1MW Hadong Photovoltaic Power + 0.39 MW Busan Photovoltaic Power, Bundling Project)" as a CDM project.

**June 29, 2010**

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*Validation Team Leader*

## 1. INTRODUCTION

The Korea Southern Power Corporation (hereafter KOSPO), the project participants, has contracted with Korean Standards Association (hereafter KSA) to carry out a validation of the proposed project "Bundled Hadong-Busan Photovoltaic Power Project of The Korea Southern Power Corporation (1MW Hadong Photovoltaic Power + 0.39 MW Busan Photovoltaic Power, Bundling Project)" in Korea (hereafter the project). This report summarizes the findings over the validation process that has been performed on the validation requirements of the Clean Development Mechanism (CDM).

### 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 the applicable CDM requirements. In particular, the project's baseline, the monitoring plan and the project's compliance with relevant UNFCCC and host Party 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. The validation is seen as necessary to provide assurance to stakeholder of the quality of the project activity and its intended generation of certified emission reduction (CERs).

### 1.2 Scope

The scope of the validation is defined as an independent and objective review of the project design document (PDD) and the relevant documents. The information in these documents is reviewed against the criteria stated in *Article 12 of Kyoto Protocol (decision 17/CP.7)*, the *CDM modalities and procedures* as agreed in the Marrakech Accords, the *simplified modalities and procedures for small-scale CDM project activities* and the relevant decisions of the COP/MOP and the CDM Executive Board including the approved baseline and monitoring methodology AMS-I.D. version 15. The KSA validation team follows a risk-based approach in the validation focusing on the identification of significant risks for project implementation and generation of certified emission reductions (CERs). Validation is not meant to provide any consulting toward the project participants. However, the corrective action requests (CARs) and clarifications (CL) may have provided input for improvement of the project design.

## 1.3 Validation Team

The validation has been performed by the following personnel;

<i>Role/Qualification</i>	<i>Name</i>	<i>Document Review</i>	<i>Site Visit</i>	<i>Follow-up Actions</i>	<i>Reporting</i>
Team Leader, Sector Expert	Mr. Kyoo-II Sohn	✓	✓	✓	✓
Team Member	Mr. Ju-Dong Yeo	✓	✓	✓	
Observer	Mr. Chang-woo Lee	✓	✓	✓	✓
Technical Reviewer	Mr. Dong-gook Yang				

For the qualification of individual team members, see appendix B

## 2. METHODOLOGY

To assess the correctness of the information provided by the project participants, the validation consists of the following three phases;

### I . Review of Documents, including;

- Review of data and information to verify the correctness, credibility and interpretation of presented information;
- Cross checks between information provided in the PDD/1-1/ and information from sources other than that used, if available, and if necessary independent background investigations.

### II. Follow-up actions, including;

- Interview with relevant stakeholder in the host country, personnel with knowledge of the project design and implementation;
- Cross-check of information provided by interviewed personnel to ensure that no relevant information has been omitted the validation

### III. The resolution of outstanding issues and the issuance of the final validation report and opinion.

Validation Protocol Table 1: Mandatory Requirements for Clean Development Mechanism Project Activity			
Requirement	Reference	Conclusion	Cross reference/Comment
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 noncompliance 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)	Comments	Draft and/or Final Conclusion
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.	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 noncompliance with the checklist question (See below). Clarification Request (CL) is used when the validation team has identified a need for further clarification.

Validation Protocol Table 3: Resolution of Corrective Action and Clarification Requests			
Description of Corrective Action Requests and Clarification	Ref. to checklist table 2	Comments/Responses from project proponent	Conclusions
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 summarized 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

## 2.1 Review of Documents

The validation is performed by KSA primarily based on the review of the PDD /1-1/ and the other supporting documentations. The PDD version 01 dated 6 May 2009 was initially reviewed and KSA requested the project participants to present the supporting information and documents the related with the project design and such additional information and documents were also reviewed by KSA. Through the validation process, the PDD and the relevant documents were evaluated to confirm the actions taken by the project participants to the CARs and CLs issued by KSA.

## 2.2 Follow-up Interviews

Follow-up interviews with the stakeholder and site visit were performed in the period of 28 - 29



July 2009 and 5 August 2009. The schedule on site visit and interviewed personnel were as follows:

28 July 2009 visit the Busan PV Plant project site (Gamcheon-1-dong, Saha-gu, Busan Metropolitan City (Latitude 35°05'14"N and Longitude 128°59'56"E)

Interview with the representing of the Local NGO

Interview with the chief of Dong (township official)

Interview with the operation and maintenance (O&M) service providers

29 July 2009 visit the Hadong PV Plant project site (Gadeok-ri, Geumseong-myeon, Hadong-gun, Gyeongsangnam-do (Latitude 34°57'16"N and Longitude 127°49'26"E)

Interview with the representing of the local resident

Interview with the Local NGO

Interview with the operation and maintenance (O&M) service providers

05 August 2009 Meeting with the project participant (KOSPO)

The list of person interviewed is included in the reference. The main topics of the interviews are summarized as follows;

Organization	Interview topics
the representing of the local resident	<ul style="list-style-type: none"> <li>- Environmental impacts</li> <li>- Stakeholder's comments</li> </ul>
the chief of Dong (township official) or the local NGO	
O&M service providers Electricity Section	<ul style="list-style-type: none"> <li>- Technology applied and operational lifetime</li> <li>- Provisions for training, operation and maintenance</li> <li>- Monitoring and reporting procedures</li> </ul>
KOSPO Environment & Chemistry Team	<ul style="list-style-type: none"> <li>- Clarification on technical details of the project.</li> <li>- Confirmation on non-involvement of ODA.</li> <li>- Monitoring and reporting procedures</li> <li>- Additionality</li> <li>- Baseline methodology.</li> <li>- Estimated emission reduction and emission factors applied</li> <li>- Stakeholder consultation process</li> <li>- Environmental impacts</li> <li>- Legal compliance.</li> <li>- Resources, training needs and procedures for operation and maintenance.</li> <li>- Benefits from CDM registration.</li> <li>- Prior to the CDM consideration</li> </ul>

## 2.3 Resolution of clarification and corrective action requests

As an outcomes of the validation process, the validation team can raise Corrective Action Requests (CAR) and Clarifications (CLs) in order to confirm that the proposed project activity meets the CDM requirements and can achieve credible emission reductions(CERs). CARs and CLs require the project participants to modify the project design, to rectify the PDD or to provide adequate additional explanations or evidence. Criteria for CARs and CLs are as follows and are based on the "Clean Development Mechanism Validation and Verification Manual"(EB44 Annex 3) /2-1/.

- Corrective Action Request (CAR) shall be raised if one of the follows occurs;
  - a) The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;
  - b) The CDM requirements have not been met;
  - c) There is a risk that emission reduction cannot be monitored or calculated.

- Clarification (CL) Request shall be raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

The validation by KSA identified seven (7) CARs and eight (8) CLs. The resolution of CARs and CLs raised by KSA is to be reflected in the revised PDD and submitted to KSA for validation conclusion.

## 2.4 Internal Quality Control

After all issues raised by validation team has been cleared, validation team leader submitted validation report to administrative personnel of KSA. The administrative personnel designated Mr. Dong-gook Yang as a technical reviewer based on internal procedure, and Mr Dong-gook yang conducted technical review with technical expert who assigned technical area of the project activity. After technical review has been conducted, KSA held review committee and approved final validation report.

## 3 Validation Findings

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

### 3.1 Approval

The only project participant is the Korea Southern Power Corporation (KOSPO). The Host Party - the Republic of Korea - meets all relevant participation requirements. The Republic of Korea has ratified the Kyoto Protocol on 08 Nov 2002 and established "the CDM Review Committee", "Prime Minister's Office" as its DNA. The DNA of Republic of Korea has approved on 7 June 2010 (Document No. 2010-011) /1-21/ confirming the voluntary participation of Korea Southern Power Co., Ltd and contributing to sustainable development in Korea.

Parties to the Kyoto Protocol have been confirmed via Korea's DNA lists on the UNFCCC web sites. Letters of the approval have been received from party.

KSA received Letters of approval from the project participant and confirmed them by calling DNA.

### 3.2 Participation

The project participant has been approved by the corresponding Party which is confirmed by the issued LoA/1-21/. Project participant listed in the PDD/1-1/ was cross-checked by the letters of approval. Letter of approval states that the project participant is voluntary.

The project is owned by the Korea Southern Power Corporation (KOSPO) and the validation did not reveal any information that indicates that the project can be seen as a diversion of official development assistance (ODA) funding toward Korea.

### 3.3 Project Document

PDD used is CDM-SSC-PDD ver. 03 which is the most recent PDD format and compliant with relevant form and guidance as provided by UNFCCC. Completeness was assessed through the protocol included as Appendix A of this report.

### 3.4 Project Description

#### 3.4.1 General Information

The proposed project activity involves installation of a grid connected 1.39MW<sub>e</sub> the bundled solar photovoltaic power plants. The electricity generated from solar photovoltaic power plant will be exported to the KEPCO grid. And thus displace electricity produced from a thermal power plant which uses a fossil fuel and result in reduced GHG emission. The installed capacity of the

project are composed of 1.0 MW<sub>e</sub> and 0.39MW<sub>e</sub> and the yearly generation is likely to be 1,680 MWh. The estimated emission reduction attributable to the project activity are 10,780 tCO<sub>2-eq</sub> per over the selected 10 year crediting period, with annual average reduction of 1,078 tCO<sub>2-eq</sub>. The technology applied to the proposed project activity is as follows;

Items		Technology Standard			Remarks
		Hadong PV	Busan PV		
Solar Cells	Maximum output power	160 W <sub>p</sub>	170 W <sub>p</sub>	200 W <sub>p</sub>	
	Number of Module	6,240 pieces	1,428 pieces	736 pieces	
	Efficiency	15.0 %	13.36%		
	Capacity	1MW <sub>e</sub> (998.4KW <sub>e</sub> )	0.24 MW <sub>e</sub> (242.76KW <sub>e</sub> )	0.15 MW <sub>e</sub> (147.20KW <sub>e</sub> )	
Inverter	Type	Grid Connected	Grid Connected		
	Rated Voltage	DC300V	DC 380/220V		
	Capacity	250 KW × 5units ( 1 standby)	100KW × 2units 50KW × 1units	100KW × 1 unit 50KW × 1units	
	Control method	PWM Inverter	PWM Inverter		
	Node form	3-phase, 3-wire	3-phase, 3-wire		
	Efficiency	more than 95%	more than 95%		

The proposed project activity is a grid connected 1.0 MW<sub>e</sub> (998.4KW<sub>e</sub>) solar photovoltaic power plant located in Haddong-gun, Gyeosangnam-Do (Province) and 0.39 MW<sub>e</sub> solar photovoltaic power plant located in Busan Metropolitan City, Republic of Korea. Hadong photovoltaic system is composed 6,240 pieces of 160W<sub>p</sub> solar cell with 250kW × 5 units inverter (one for standby). Busan photovoltaic system is composed of 1,428 pieces of 170W<sub>p</sub> with 100kW × 2 units inverter and 736 pieces of 200 W<sub>p</sub> with 100 kW x 1 unit inverter and 50 kW x 1 unit inverter.

The technology applied to the proposed project is deemed current good practice and is not expected to be replaced within the crediting period. The project will have all inherent benefits of a renewable energy project. The starting date has been identified as the date on which the contract on the construction of the proposed project signed. The starting date is 26 March 2008 for Busan photovoltaic power plant and 17 March 2008 for Hadong photovoltaic power plant respectively.

The operational lifetime of the proposed project is estimated to be around 20 years and the crediting period without renewable of 10 years starting on registration date. The project activity will have all inherent benefits of a renewable energy. Moreover, the project activity will contribute

to the local economic development and the sustainable development objectives of the Republic of Korea.

The information presented in the PDD on the technical design as above is consistent with the actual planning and implementation of the project activity as confirmed by;

- Review of data and information was checked at the desk review stage by following documents;
  - PDD/1-1/,
  - Permit of electricity business for Busan PV and Hadong PV respectively /1-4/
  - Specification for Solar Module (Model : KPEM-S170A72) (<http://www.psec.co.kr>) /1-11/
  - PV Module Specification for SM-200PA0 (<http://www.s-energy.co.kr>)/1-12/
- An on-site visit has been performed and relevant stakeholder and personnel related to operation and maintenance were interviewed. And also checked with design drawing including specification and capacity and number of module.
- Finally information related to similar PV projects or technologies as a registered CDM project activity in Korea have been used if available to confirm the accuracy and completeness of the project description.

In the view of the above, KSA confirms that the project description as included in the PDD is sufficiently accurate and complete in order to comply with the requirements of the CDM

### 3.4.2 Eligibility as a Small Scale Project

The proposed project activity is grid connected solar photovoltaic based on renewable power generation. The qualification of the project activity as a small-scale project activity is confirmed during the on-site visit as follows;

- Maximum output capacity.

The project qualifies as small-scale project activity as the maximum output capacity of 1.39 MW<sub>e</sub> which is less than the 15 MW<sub>e</sub> capacity limit stipulated in paragraph 6 (c) of decision 17/CP.7. Therefore the description of project design justifies the applicability criteria of approval small scale methodology AMS- I .D. Grid connected renewable electricity generation version 15. /2-7/

- Debundling

The definition of debundling for SSC project activities is stated in Annex 27 of EB 36/2-3/, and it was confirmed during on-site visits. that those items for followings related to debundling don't be applied to the proposed project activity.

- With the same project participants
- In the same project category and technology/measure
- Registered within the previous 2 years
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale

activity at the closest point.

### 3.4.3 Choice of the Crediting Period

The crediting period for this project activity is considered as fixed crediting period of 10 years starting on the registration date. The expected operational lifetime for solar photovoltaic modules is estimated to be 20 years. Selection of the fixed crediting period of 10 years is also found acceptable in respect to the expected operation time of 20 years for the project activity, as mentioned in Section C of the PDD/1-1/.

## 3.5 Baseline and Monitoring Methodology

### 3.5.1 Applicability of the Selected Methodology to the Project Activity

According to Appendix B of Annex II 'Simplified modalities and procedures for small-scale CDM project activities', the selected baseline methodology refers to project type I (Renewable Energy Projects) and project category D (Grid connected renewable electricity generation).

The project activity has applied baseline as mentioned in the approved methodology AMS-I.D. version 15 /2-7/. The project activity generates renewable electricity from solar photovoltaic and the generated electricity will be supplied to the KEPCO grid replacing fossil fuel generated electricity.

The baseline selected for the project is the continuation of generation at current level of emission from the KEPCO grid system.

The proposed project activity is confirmed at desk review and on-site visit as follows;

- generates about 1.39MW<sub>e</sub> of electricity by solar energy, one of renewable energies.
- The electricity generated by PV power plant is supplied to the KEPCO grid system.

Thus, the selected methodology to the proposed project activity is applicable.

### 3.5.2 Project Boundary

The project boundary encompasses the physical geographical site of the renewable energy generation source. The power generated by the proposed project activity will be exported to the KEPCO grid system. Therefore the KEPCO grid has been cooperated in the project boundary. The project boundary description is clear in accordance to the project category of the approved methodology.

### 3.5.3 Baseline Identification

According to "the 4th Basic plan of long-term electricity supply"/1-22/ by MKE, electricity energy situation in Korea are as follows;

- Electricity consumption growth rate has gradually decreased.
- \* 11.6% in '91~'95 → 8.0% in '96~'00 → 6.8% in '01~'04 → 5.7% in '05~'07

- Electricity consumption for the 3 year period 2005~7 was higher than forecasted (the average forecast of former BPEs) by 3~5%.
- Measures such as the rationalization of the electric rate system and energy efficiency improvement are taken and pursued in order to achieve the target demand.
- Measures Related to Long-term DSM
  - Making the most use of DSM resources taking into consideration the status of supply and demand.
  - Improving DSM results by promoting effective DSM projects.
  - Reflect energy saving amount by promoting efficiency improvement projects such as high efficiency apparatus.
- Generating Capacities Expansion
  - Generation capacities expansion plan.4th (BPE, '08-'20)

Unit: MW

Nuclear	Goal	LNG	Oil	Renewables	Pumped storage/RCS	Total
15,200	9,480	10,730	77	6,456	5,743	47,686

- Generator retirement (2008~2022): total of 3,886MW (22 units).
- SMP (System Margin Price) (source: <http://epsis.kpx.or.kr>) trend has gradually increased ₩79.07/kWh in 2006, ₩83.7/kWh in 2007, ₩122.63/kWh in 2008 and ₩105.4/kWh in 2009
- Renewable energy situation
  - Current Status of renewable facilities as of December 2007: total of 1,943MW.
    - \* Hydro generating capacity 1,592MW (81.9%), Solar PV 37.8MW (1.9%)
  - Outlook for renewable facilities expansion : total of 6,456MW new renewable facilities are expected to be constructed during the period 2008 ~ 2022
    - \* ocean energy (tide energy) facilities are expected to amount to 3,081MW (48%)

Emissions reductions are determined by the AMS-I.D version 15/2-7/ methodology mentioned in the PDD/1-1/. This project activity is to generate electricity using solar energy and supplies electricity to grid that would have been supplied by at least one fossil fuel-fired generating unit. Thus, the baseline is the kWh produced by the renewable generating unit multiplied by an emission factor (measured in tCO<sub>2</sub>/MWh).

The information presented in the PDD/1-1/ has been validated by the first desk review of all the data, further confirmation based on the on-site visit and a final step by cross-checking the information with similar PV power project. The sources referenced in the PDD/1-1/ have been correctly quoted. The information was cross-checked based on verifiable and credible source, such as;

- 1) Documents are provided by PPs
  - Permit of electricity business /1-4/



- Construction Contract /1-8/
- Specification for Solar Module (Model: KPEM-S170A72)/1-11/
- PV Module Specification for SM-200PA0 /1-12/
- Certificate of pre-operation inspection by Korea Electrical Safety Corporation/1-16/

## 2) Documents for cross checking by KSA

- Feasibility Study Report - Supporting System in Feed-in Tariffs of Electricity generation from New and Renewable Energy Source by MKE (Ministry of Knowledge and Economy) of Korea (<http://www.mke.go.kr>) /1-17/
- Study on feed-in tariff of PV power plant in Korea by KERI (Korea Electrotechnology Research Institute) /1-18/
- Act on operation of electricity market by KPX (Korea Power Exchange) /1-19/
- The 4th Basic plan of long-term electricity supply by MKE of Korea/1-22/
- Act on the promotion of the Development, use and diffusion of new and renewable energy./1-23/
- The Status of generation facility for 2008 by KPX /1-24/
- The Fundamentals of Energy Act /1-25/

Based on the validated assumptions on calculations, KSA considered the identified baseline scenario is reasonable. KSA confirms that all related CDM requirements, including relevant and/or sectoral policies and circumstances, have been correctly identified taken into account in the definition of the baseline scenario. A verifiable description of the baseline scenario has been included in the PDD/1-1/, KSA confirms that;

- All the assumptions and data used by the project participants are listed in the PDD/1-1/, including their references and sources;
- All documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the PDD/1-1/;
- Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable;
- Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD/1-1/;
- The approved baseline methodology has been correctly applied to identify the most reasonable baseline scenario and the identified baseline scenario reasonably represents what would occur in the absence of the proposed CDM project activity.

### 3.5.4 Algorithms and/or formulae used to determine emission reductions

KSA assessed the calculation of the baseline emission, project emissions and leakage and emission reductions. The corresponding calculations, parameters and equations are presented in

B.6.3 of the PDD/1-1/. The parameters and equations presented in the PDD/1-1/ and further documentation have been compared with the information and requirements presented in the methodology and respective tools.

The assumptions and data used to determine the emission reduction are listed in the PDD/1-1/ and all sources have been checked and confirmed. Based on the information reviewed it can be confirmed that the sources used are correctly quoted and interpreted in the PDD/1-1/.

The value presented in the PDD/1-1/ are considered reasonable based on the documentation reviewed, further references and the results of the interviews. The baseline methodology has been correctly applied following requirements. The estimated baseline emissions can be confirmed as the same have been replicated by the audit team using the information provided. Detailed information on the verification of the parameters used in the equation can be found in the appendix A. The algorithms for the determination of the baseline, project and leakage are discussed in the following sections.

## 1) Baseline Emissions

Emissions reductions were calculated according to the methodology, AMS-I.D. version 15/2-7/ and emission factor was also calculated based on the approved methodology of "Tool to calculate the emission factor for an electricity system (version 01.1)"/2-8/

The information presented in the PDD/1-1/ has been validated by the first desk review of all the data, further confirmation based on the website (<http://www.kepco.co.kr>) and a final step by cross-checking the information with similar PV power projects which are registered as CDM project.

The documents and information used to confirm baseline emission factor are as follows;

### 1) Documents are provided by PPs

- Excel Spreadsheets for calculation of operating margin and build margin emission coefficient./1-2/

### 2) Documents for cross checking by KSA

- 5 years (2004 ~ 2008) "Statistics of Electric Power in Korea" /1-9/.

Those are available on the website (<http://www.kepco.co.kr>)

- The Fundamentals of Energy Act of Korea./1-25/
- IPCC guideline on *greenhouse gas inventories* /2-4/ and /2-6/
- The status of generation facility for 2008 by KPX (Korea Power Exchange) /1-24/

Since the project activity is the installation of a new grid-connected renewable power plant, the baseline scenario is correctly identified as an electricity delivered to the grid by the project activity by the combined margin (CM) calculation described in the "Tool to calculate the emission factor for an electricity system"/2-8/, namely "electricity amount by the project activity" \* "CM factor".

For this purpose it has been validated by KSA validation team that the project participant applied all the 6 steps as per the approved baseline methodology.

Since the Korean electricity system is not constituted of layered dispatch system, the national grid is considered for the determination of a baseline grid electricity emission coefficient ( $EF_{CO_2}$ ).

## 1. Step 1 Identify the relevant electric power system

The electricity by the proposed project activity is connected physically to KEPCO grid which is the only one in Korea. And the power plant in islands except Jeju Island are not connected to the national grid, so they are not considered. Thus, the relevant electric power system is KEPCO grid.

## 2. Step 2 Select an Operation Margin (OM) Method.

During the most recent 5 years (2004 ~ 2008), low-cost/must run resources constitute 40.40% of total grid generation which is less than 50%. So Simple OM method was chosen.

## 3. Step 3 Calculate the operating margin emission factor according to the selected method.

According to the selected method, simple OM is calculated as the generation-weighted average emission per electricity unit of all generating power plant within KEPCO grid, not including low-operating cost and must run power plants for three years (2006 ~ 2008).

Subsequently choosing Option A, the simple OM emission factor is determined as per formular 1 of tool as  $OM = 0.6816$ .

## 4. Step 4 Identify the cohort of power units to be included in the build margin.

In the calculation of build margin, capacity additions of the most recent plants contributing to 20% of the total generation are used. Since 20% falls on part capacity plants contributing to 20.38% of the total generation have been considered during build margin calculations.

The approximate operating margin is calculated as average of data available for three years 2006, 2007 and 2008, which is the most recent statistics available at the time of initial PDD preparation. The build margin is calculated using data of 2008.

## 5. Step 5 Calculate the build margin (BM) emission factor.

BM is calculated as the generation-weighted average emission factor of all generating power plant within KEPCO grid during the most recent year y for which power generation data is available. BM emission factor is determined as per formular 13 of tool as  $BM = 0.5221$ .

## Step 6 Calculate the combined emission factor.

According to "Tool to calculate the emission factor for an electricity system/2-8/", the weighting

factor is set to be respectively  $W_{OM} = 75\%$  and  $W_{BM} = 25\%$  during the crediting period.

The combined margin (CM) of the project activity is calculated as 0.6417 tCO<sub>2-eq</sub>/MWh. The baseline emission factor determined ex-ante will be used for calculation of emission reductions.

OM	BM	CM
0.6816	0.5221	0.6417

With the expected generation of 1,680 MWh per year to the KEPCO grid, the annual baseline emission will be 1,078 tCO<sub>2-eq</sub>.

All steps and formula mentioned in the methodology are properly applied in the PDD. There is no transfer of energy generating equipment from another activity or the transfer of exiting equipment to another activity. The emission reduction by the project will be direct function of the net electricity fed to the KEPCO grid.

The power sector data used for the calculation has been cross checked as follows;

- Each power plant of the electric generation amount : "Statistics of Electric Power in Korea" /1-9/
- Each power plant of the generation equipments : "Statistics of Electric Power in Korea" /1-9/ and "The status of generation facility for 2008 by KPX /1-24/.
- Each Fuel of CGVs and NCVs : "The Fundamentals of Energy Act"/1-25/ and IPCC guideline on greenhouse gas inventories /2-4/ and /2-5/

As above, KSA confirmed that all data used for the calculation are not excessive and appropriate.

All the equations involved along with the KEPCO grid power sector data used for calculation were found by the validation team to be in line with the "Tool to calculate the emission factor for an electricity system, version 1.1" /2-8/. The ex-ante determined grid emission factor will be fixed for the selected crediting period. The grid emission factor value (CM) has been validated as 0.6417 tCO<sub>2-e</sub>/MWh, the same value has properly been used in the emission reduction calculation as per the requirement of AMS-I.D version 15 /2-7/.

## 2) Project Emissions

Thus as per the requirement of AMS-I.D. version 15 calculation of project is not applicable for the proposed project activity which is renewable energy project activity under consideration,  $PE_y = 0$ .

## 3) Leakage

Thus as per the requirement of AMS-I.D. version 15 calculation of leakage emission is not applicable for the project activity which is renewable energy project activity under consideration,  $LE_y = 0$ .

#### 4) Emission Reductions

According to the approved methodology, emission reductions are calculated as follows;

$$ER_y = BE_y - PE_y - LE_y$$

where,  $ER_y$  : Emission reductions in year y ( $tCO_{2e}/y$ )

$BE_y$  : Baseline emissions in year y ( $tCO_{2e}/y$ )

$PE_y$  : Project emissions in year y ( $tCO_{2e}/y$ )

$LE_y$  : Leakage emissions in year y ( $tCO_{2e}/y$ )

Baseline emission is calculated as net electricity supplied by the project activity to the Grid ( $EG_{BL,y}$  in MWh) multiplied by an emissions factor ( $EF_{CO_2}$  in  $tCO_{2eq}/MWh$ ). No project emissions need to be considered, as the proposed project activity is a renewable energy project. No leakage has to be considered for the proposed project activity.

According to the Section C of PDD/1-1/, the proposed project activity is yet to be commissioned and the start of 10 years crediting period without a renewal has been stated as the registration date. The emission reduction seems to be in line with the envisioned time schedule for the project's implementation and the indicated crediting period.

### 3.6 Additionality of a Project Activity

#### 3.6.1 Starting Date of CDM project activity

The starting date of CDM project activity is the earliest date at which either the implementation of consideration or real action of a project activity begins. The dates of contract of construction (including material purchasing) for PV power plant are identified as a starting date of this project activity which are that Hadong PV power plant is 17 March 2008 and Busan PV power plant is 26 March 2008. There are other date which could be considered as a starting date of this project activity such as a permission date of electricity business by local government and date of the commencement for construction works. However KSA regarded this the date of "construction contract" /1-8/ as an official consent to the project activity and accepted it as the starting date because the project proponent was committed to expenditures related to the implementation or construction of the project activity

## 3.6.2 Prior Consideration of the CDM

KSA validation team confirmed through the Contracting "Memorandum of Understanding (MOU)" /1-5/ CDM Consulting to the Small Scale CDM project with Eco Eye Consulting Co., Ltd. on date 13 September 2005 that KOSPO had considered for CDM prior to the proposed project. Also, KSA Validation team confirmed that KOSPO had performed "a Basic plan establishment of CDM project registration and management"/1-6/, and "investment analysis of Hadong/Busan photovoltaic power CDM project"/1-7/ including the expected CDM revenue.

It is judged that the project proponent (KOSPO) seriously considered incentives from CDM before their decision to proceed with the project. Thus, the proposed project was seriously considered as a CDM project initially by the project proponent and the relevant timetable to the proposed project are as follows;

<Table 3-1> Timetable of the implementation of the proposed project>

Date	Activity
13 Sep 2005	Contraction memorandum of understanding CDM consulting to Eco Eye Co., Ltd.
Nov 2005	Basic Plan establishment of CDM project registration and management
Sep 2007	Investment analysis of Hadong/Busan PV CDM project
Feb 2008	Planning to promote CDM project activity bundling with Hadong PV, Busan PV and others.
Mar 2008	The contracting for construction - Mar 17 for Hadong PV Plant Mar 26 for Busan PV Plant
Jul 2008	The complete of construction - Jul 23 for Hadnong PV Plant Jul 29 for Busan PV Plant

## 3.6.3 Investment Analysis

### Additionality

According to the Attachment A to the Appendix B of the "simplified modalities and procedures for small-scale CDM project activities"/2-2/, the investment barrier is applied to assess the additionality of the proposed project. The investment barrier was used to assess the additionality of the proposed project activity. The investment barrier of the project has been demonstrated by a NPV as well as IRR /1-3/. Information and data applied to additionality are summarized in <Table 3-2> Input Data for additionality

- Annual Electricity Generation : 1,680MWh/yr

The electricity generation was calculated as follows;

Annual electricity generation = Installed capacity \* utilization rate \* Annual hours

\* (1 - auxiliary power & loss)

For Hadong PV Plant =  $998.4\text{kW} * 15\% * 8,760\text{hrs} * (1-0.05) \div 1,000 = 1,246 \text{ MWh/yr}$

For Busan PV Plant =  $389.96\text{kW} * 13.36\% * 8,760\text{hr} * (1-0.05) \div 1,000 = 434 \text{ MWh/yr}$

Solar cell utilization rate and auxiliary power & loss were provided by manufacturer and project participant. Validation team cross-checked capacity factor with other similar PV power plants which is registered as CDM project and it shows that range is 13.5% ~ 17.5% and found that the selected capacity factors, 14.25% and 12.69%, are slightly low. But referring to manufacture's explanation, the results of monitoring for other similar PV project and local circumstance, KSA validation team concluded that these capacity factor is valid and applicable at the time of investment decision.

**<Table 3-2> Input Data for additionality**

Items	Calculated based	Remarks
Expected electricity generation amount (MWh/yr)	<ul style="list-style-type: none"> <li>▪ Hadong PV plant  <math>998.4\text{kW} * 15\% * 8,760\text{hrs} * (1-0.05) \div 1,000</math>  <math>= 1,246 \text{ MWh/yr}</math> </li> <li>▪ Busan PV plant  <math>389.96\text{kW} * 13.36\% * 8,760\text{hr} * (1-0.05) \div 1,000</math>  <math>= 434 \text{ MWh/yr}</math> </li> <li>▪ Total  <math>1,246 \text{ MWh/yr} + 434 \text{ MWh/yr} = 1,680 \text{ MWh/yr}</math> </li> </ul>	
Sales price per KWh	89.64 KRW/kW * the highest price in 2006. 9 to 2007. 8.	<a href="http://epis.kpx.or.kr/1-27/">http://epis.kpx.or.kr/1-27/</a>
Installation Costs	<ul style="list-style-type: none"> <li>▪ Hadong PV plant : 7,378,000,000 won (including materials and construction cost)</li> <li>▪ Busan PV plant : 3,910,000,000 won (including materials and construction cost)</li> </ul>	Construction Contract/1-8/
Operation and Maintenance costs (including taxes)	<ul style="list-style-type: none"> <li>▪ Hadong PV plant : ₩53,829,000/yr about 0.73% of investment cost</li> <li>▪ Busan PV plant : ₩27,149,000/yr about 0.72% of investment cost</li> <li>※ Operation &amp; Maintenance Costs are included labor cost, operating cost, repair cost, tax and insurance cost</li> </ul>	FSR by MKE /1-17/
Period of assessment	20 years	FSR by KERI /1-18/
Exchange rate and CERs Price	<ul style="list-style-type: none"> <li>▪ Average Exchange Rate from Sept 2006 to Aug 2007 : ₩1,235.99/€</li> <li>▪ CERs Price Range : €10/ton ~ €20/ton</li> </ul>	<a href="http://www.keb.co.kr/1-28/">http://www.keb.co.kr/1-28/</a> <a href="http://www.pointcarbon.com">http://www.pointcarbon.com</a> /1-29/



- Investment Costs : ₩11,288 million

KSA validation team checked investment cost based on Construction contract /1-8/ (including material cost and construction cost) and breakdown of cost. Unit costs of this PV project are calculated as ₩10,027,000/kW for Busan PV power plant and ₩7,390,000/kW for Hadong PV power plant. And validation team examined investment cost with other similar PV power plant in Korea which is registered as a CDM project and it shows that range is ₩6,500,000/kW ~ ₩9,300,000/kW. And Busan PV power plant was installed on the parking area with H-beam structure, so installation unit cost is higher than other similar PV power plants. In referring to project participant's explanation, local circumstance and architecture costs, validation team concluded that investment cost of this project is not overestimated and valid at the time of investment decision.

- O&M Cost : ₩79,016,000/yr (0.7% of investment costs)

According to feasibility study report, "Supporting System in Feed-in Tariffs of Electricity Generation from New & Renewable Energy Sources"/1-17/ by MKE, O&M cost (including labor cost, operating cost, repair cost and insurance cost) is 2.8% of investment cost in Korea at 2006 year and it will be down until 1% of investment cost when PV power plant has been widespread throughout the country. For this project activity, O&M costs were applied 0.7% of investment cost, as a conservative view. Validation team concluded that O&M cost in this project is valid and applicable at the time of investment decision.

- Electricity Tariffs : ₩89.65/KWh

Electricity Tariffs in this project is ₩89.65/KWh which is the highest value from Sep 2006 to Aug 2007. Also validation team examined this value with statistical value by KPX (<http://epis.kpx.or.kr>) to check it applicability. KSA validation team confirmed that ₩89.65/KWh is valid and applicable at time of investment decision.

- Operation lifetime of the project activity : 20 years

According to "Study on feed-in tariff of PV power plant in Korea /1-18/" by KERI (Korea Electrotechnology Research Institute, <http://www.keri.re.kr>), operation lifetime of PV power plant is assessed as 20 ~ 25 years. And validation team concluded that 20 years of operation lifetime for this project activity is valid to refer other similar project's operational lifetime, a technological level and technical expertise.

- Discount rate : 7%

According to feasibility study report, "Supporting System in Feed-in Tariffs of Electricity Generation from New & Renewable Energy Sources"/1-17/ by MKE, criteria for discount rate is 7%. Validation team concluded that discount rate of 7% for this project activity is deemed to



be reasonable and appropriate. And these rates are available value to use at the time of decision-making.

The validation team has verified all sources of the IRR and NPV (the net present value) calculation /1-3/ as presented in B.5 of PDD /1-1/ and the calculation spreadsheet for confirming correctness of calculation and the consistency of the applied data. Validation team verified additionality by conducting investment analysis method for this project, and IRR was minus (#DIV/0!) which was much less than benchmark and also NPVs are (-)₩6,796mil. without CERs and (-)₩6,659mil with CERs (20 EURO) for Hadong PV plant and (-)₩3,803mil without CERs and (-)₩3,755mil with CERs (20 EURO) for Busan PV plant.

And also a sensitivity analysis has been conducted on the NPV and IRR for capacity factor parameters with variation ranges, discount rate (7%)  $\pm$  2%, utilization (13.36% ~ 15%)  $\pm$  5% and SMP (₩89.64/kW) +20%. According to the results of sensitivity analysis, IRRs of both site for this project activity still becomes <0% which is much lower than the benchmark 7% and NPV of both site for this project activity had negative. In referring to the Korea's economical structure, condition, average of economic growth and inflation rate, (<http://www.kosis.kr>), KSA validation team concluded that above variation range for sensitivity analysis parameter is a conservative method.

It has been verified from the IRR and NPV calculation attached with the PDD that the returns from the project in the absence of the benefits from CDM are not attractive enough for the project proponent to go forward with the project. So, the proposed project activity is not financially attractive or feasible. Thus it has been established that the project activity would not have occurred in the absence of CDM and is hence additional.

## 3.7 Monitoring Plan

### 3.7.1 Collecting data and reporting

The monitoring methodology correctly applies the choice of both options for monitoring project and baseline emissions. The monitoring plan of the proposed project activity has followed the applied methodology in context of the parameters to be monitored.

In this project activity, the only parameter to be monitored to calculate emission reduction is the net electricity ( $EG_y$ ) supplied to the KEPCO grid. The choice of project GHG indicators is found reasonable and in conformance with the requirements set by the applied methodology. The monitoring plan consists of metering the electricity exported to the KEPCO grid, and the quantity of transmitted electricity will be electronically measured and transferred to Korea Power Exchange (KPX) (<http://www.kpx.or.kr>) and project proponent. So it is cross-checked by both entities. Also the data of transmitted electricity is collected hourly and archived electronically. All data will be archived electronically for a period of two years after the crediting period.

### 3.7.2 Monitoring System

As per the KPX(Korea Power Exchange) regulation "Act on operation of electricity market"/1-19/, electricity meter of this project activity should be re-calibrated within 3 and a half years, but the watt meter will be re-calibrated at least once in 3 years according to *"indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories(EB 41th Report Annex 20)"/2-2/*.

The monitoring plan in the PDD properly described the quality control and quality assurance to ensure delivery of the high quality data. And the selected data/parameters will meets reliable QA/QC procedure as QMS, and periodic calibration of the monitoring equipments will be carried out by competent. The overall responsibility and authority for daily monitoring, reporting and maintenance is established

### 3.8 Sustainable Development

The LoA of the Host country, the Republic of Korea, clearly presents a statement that this project activity contribute to the sustainable development in Korea.

### 3.9 Local stakeholder Consultation

The identified local stakeholder for the this project activity, as mentioned in the Section E of the PDD, are the local NGOs, the local government and the residents of nearby village in that area. During on-site interview with the NGOs, a representative of villager and a chief of Dong (township official) for Busan PV power plant and Hadong PV power plant, there is no objections or arguments to the relevant of project activity.

### 3.10 Environmental Impacts

According to the Korean law "the Act on Assessment of Impacts of Works on Environmental, Traffic, and Disasters" /1-20/, the project participant has to perform EIA (Environmental Impacts Assessment) in case that the capacity of photovoltaic power plant is over 100 MW.

As per criteria to the law, Busan PV was not required. Also Busan PV was built on the parking lot of Busan thermal power plant. Validation team confirmed that there are no any significant environmental impact due to photovoltaic power plant.

However, Hadong PV power plant was performed amendment EIA /1-15/ owing to change existing power plant usage condition. Thus, the EIA were carried out on climate, water quality, noise, and natural ecosystem related to the usage change of real estate for new PV power plant construction. The conclusion of the report showed that there are no any significant environmental impact for the Hadong PV power plant.

## 4. COMMENTS BY PARTIES, stakeholder AND AND NGOs

The Project Design Document for this project was made available on the UNFCCC website and was open for comments from Parties, stakeholder and NGOs from 15-07-2009 until 14-08-2009. No comments were received.

## 5. REFERENCES

### Category 1 Documents:

*Documents provided by the Client that relate directly to the project.*

- /1-1/ KOSPO (Korea Southern Power Co., Ltd.) - CDM Project Design Document (PDD) for Small-Scale Activity - ""Bundled Hadong-Busan Photovoltaic Power Project of The Korea Southern Power Corporation (1MW Hadong Photovoltaic Power + 0.39 MW Busan Photovoltaic Power, Bundling Project)" version 07, dated on 15 April 2010 and version 1, dated on 06 May 2009
- /1-2/ Excel Spreadsheets for calculation of the operating margin and build margin emission coefficient
- /1-3/ Excel Spreadsheets for NPV and IRR Analysis
- /1-4/ Permit of electricity business for Busan PV and Hadong PV respectively.
- /1-5/ Memorandum of Understanding (Consulting Agreements for CDM Projects between KOSPO and Ecoeye Co., Ltd.), 13 Sep 2005
- /1-6/ A Basic Plan establishment of CDM project registration and management, 07 Nov 2005.
- /1-7/ Investment analysis of Hadong/Busan Photovoltaic power CDM project
  - Basic Plan of establishment of PV power plant for Hadong PV dated 05 Sep 2007
  - Feasibility Review and establishment planning PV power plant for Busan PV dated on 20 Sep 2007.
- /1-8/ Construction Contract for Photovoltaic PV power plant
  - Busan PV dated on 27 March 2008
  - Hadong PV dated on 17 March 2008
- /1-9/ Statics of Electric Power in Korea. (<http://www.kepco.co.kr>)
- /1-10/ Operating Manual for PV power plant
- /1-11/ Specification for Solar Module (Model: KPEM-S170A72) (by KPE: <http://www.psec.co.kr>)
- /1-12/ PV Module Specification for SM-200PA0 (by S-energy Co., Ltd: <http://www.s-energy.co.kr>)
- /1-13/ Electricity measuring meter at Busan (No. 85260922) initially sealed on 16 June 2008.  
Electricity measuring meter at Hadong (No. 46026108) initially sealed on 09 July 2008 and secondly sealed on 25 Mar 2009.
- /1-14/ Framework Act on Environmental Policy of Korea
- /1-15/ Amendment EIA (Environmental Impacts Assessment) for Hadong PV Power plant
- /1-16/ Certificate of pre-operation inspection by Korea Electrical Safety Corporation

(<http://www.kesco.or.kr>)

- For Hadong PV power plant dated on 23 July 2008.
- For Busan PV Power plant dated on 26 July 2008.
- /1-17/ Supporting System in Feed-in Tariffs of Electricity Generation from New & Renewable Energy Sources by MKE (Ministry of Knowledge Economy) (<http://www.mke.go.kr>)
- /1-18/ Study on Feed-in Tariff of PV power plant in Korea by KERI (Korea Electrotechnology Research Institute) (<http://www.keri.re.kr>)
- /1-19/ Act on operation of electricity market by KPX (<http://www.kpx.or.kr>)
- /1-20/ Act on the Assessment of Impacts of Works on Environmental Traffic, and Disasters
- /1-21/ Approval of CDM Project - DNA of Republic of Korea on 7 June 2010.
- /1-22/ The 4th Basic plan of long-term electricity supply by Ministry of Knowledge and Economy (<http://www.mke.go.kr>)
- /1-23/ Act on the promotion of the Development, use and diffusion of new and renewable energy.
- /1-24/ The status of generation facility for 2008 by KPX
- /1-25/ The Fundamentals of Energy Act
- /1-26/ New & Renewable Energy Center (NREC) (<http://www.knrec.or.kr>)
- /1-27/ Korea Power Exchange (<http://epsis.kpx.or.kr>)
- /1-28/ Korea Exchange Bank (<http://www.keb.co.kr>)
- /1-29/ <http://www.pointcarbon.com>

## Category 2 Documents:

*Background documents related to the design and/or methodologies employed in the design or other reference documents.*

*/2-1/ Clean Development Mechanism Validation and Verification Manual (version 01); EB 44th Report Annex 3*

*/2-2/ Appendix B of the simplified modalities and procedures for small-scale CDM project activities: Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories. (version 12, 02 August 2008, EB 41th Report, Annex 20)*

*/2-3/ Compendium of guidance on the debundling for SSC project activities (EB 36th Report, Annex 27)*

*/2-4/ Revised 1996 IPCC guidelines on national greenhouse gas inventories*

*/2-5/ 2006 IPCC guidelines on national greenhouse gas inventories*

*/2-6/ Tool for the demonstration and assessment of additionality (Version 05.2)*

*/2-7/ AMS-I.D. - Grid connected renewable electricity generation (version 15)*

*/2-8/ Tool to calculate the emission factor for an electricity system (Version 01.1)*

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

/1/ Interview on 28 July 2009

Name	Organization	Position
Young-il, Kim	Environment & Chemistry Section Busan Combined Cycle Power Korea Southern Power Co., Ltd.	General Manager
Yong-Ki, CHOI	Instrumentation & Control Section Busan Combined Cycle Power Korea Southern Power Co., Ltd.	General Manager
Sung-Hoon, Ko	Environment Guard (NGO) <a href="http://www.envnews.com">http://www.envnews.com</a>	President of NGO
Chang-Keun, Kim	Local government Gamcheon 1-dong, Saha-gu, Busan Metropolitan City	the chief of a dong (township) office

/2/ Interview on 29 July 2009

Name	Organization	Position
Te-Hoon Ahn	Green Environment Section Hadong Thermal Power Site Korea Southern Power Co., Ltd	Manager
Won-Gi Son	Green Environment Section Hadong Thermal Power Site Korea Southern Power Co., Ltd	General Manager
Jung-Chul Lee	Incorporated Association Conservation of Nature ( <a href="http://www.knccn.org">http://www.knccn.org</a> )	Secretary General Newspaper reporter
Sang-Kyeong Lee	A Local Resident (Gwangpori, Geumseong-myeon)	A Representative of Local residents.

/3/ Interview on 05 August 2009

Name	Organization	Position
Soo-Kyoung Kim	Power Generation Department	Assistant Manager
	Environment & Chemistry Team	
	Korea Southern Power Co., Ltd	
Chan-Hyo You	Power Generation Department	Manager
	Environment & Chemistry Team	
	Korea Southern Power Co., Ltd	
Kee-Wook Jeong	Power Generation Department	Team Manager
	Environment & Chemistry Team	
	Korea Southern Power Co., Ltd	



## APPENDIX A

### VALIDATION PROTOCOL FOR SMALL-SCALE CDM ACTIVITIES

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

Requirement	Reference	Conclusion	Cross Reference / Comment
1. The project shall assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention	Kyoto Protocol Art. 12.2	OK	Table 2 Section A2.4 - A2.7
2. The project shall assist Parties included in Annex I in achieving compliance with part of their quantified emission reduction commitment under Art. 3 of Kyoto Protocol.	Kyoto Protocol Art. 12.2,	OK	Table 2 Section A3.1 - A3.3 Host Party, Republic of Korea: Korea Southern Power Co., Ltd.. Annex I Party has not identified yet..
3. The project shall have the written approval of voluntary participation from the designated national authority of each Party involved, including confirmation by the host Parties that the project activities assists its in achieving sustainable development.	Kyoto Protocol Art.12.5a, Simplified Modalities and Procedures for Small Scale CDM Project Activities §23a	Pending OK	Table 2 Section A.3.3 <del>The project participant has not submitted the written approvals of voluntary participation yet.</del> The project participant not submitted the written approvals of voluntary participation. The copy of LoA by host Party, Republic of Korea was submitted at 7/06/2010.. Annex I Party has not identified yet..
4. The emission reductions should be real, measurable and give long-term benefits related to the mitigation of climate change	Kyoto Protocol Art.12.5b	OK	Table 2 Section B.6
5. Reduction in GHG emissions must 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, Simplified Modalities and Procedures for Small Scale CDM Project Activities §26	OK	Table 2 Section B.3
6. The project activity should lead to the transfer of environmental safe and sound technology and knowhow		OK	Table 2 Section A.4.5.

Requirement	Reference	Conclusion	Cross Reference / Comment
7. 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	No public funding from Parties in Annex I involved. Table 2 Section A.5
8. Parties participating in the CDM shall designate a national authority for the CDM	CDM Modalities and Procedures § 29	OK	Republic of Korea : CDM Review Committee, prime minister's office.
9. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol	CDM Modalities and Procedures § 30, 31b	OK	Republic of Korea was ratified the Kyoto Protocol on Nov 2002. Annex I Party has not identified yet.
10. The participating Annex I Party's assigned amount shall have been calculated and recorded	CDM Modalities and Procedures §31b	OK	Annex I Party has not identified yet.
11. 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 Modalities and Procedures §31b	OK	Annex I Party has not identified yet.
12. The proposed project activity shall meet the eligibility criteria for small scale CDM project activities set out in § 6 (c) of the Marrakesh 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 Section A.4.2

Requirement	Reference	Conclusion	Cross Reference / Comment
13. The project design document shall conform with the Small Scale CDM Project Design Document format	Simplified Modalities and Procedures for Small Scale CDM Project Activities, Appendix A	OK	The most recent PDD format version 3 is correctly applied.
14. The proposed project activity shall confirm 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 Section A.4.2 and B.1.3
15. Comments by local stakeholders are invited, and a summary of these provided	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22b	OK	Table 2 Section E
16. 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
17. Parties, stakeholders and UNFCCC accredited NGOs have been invited to comment on the validation requirements and comments have been made publicly available	Simplified Modalities and Procedures for Small Scale CDM Project Activities §23b,c,d	OK	The PDD has been made publicly available from 15 July 2009 until 14 Aug 2009 and comments were invited through the UNFCCC website. No comments received during above mentioned period.

Requirement	Reference	Conclusion	Cross Reference / Comment
18. The proposed activity conforms to all other requirements for CDM project activity in the CDM modalities and procedures that are not replaced by these simplified modalities and procedures.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22f	OK	
19. The emission reduction attributable to the proposed project shall be adjusted for leakage.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §30	OK	
20. The proposed project boundary shall encompass all anthropogenic emissions by sources of greenhouse gases under the control of the project participants that are significant and reasonably attributable to the CDM	Simplified Modalities and Procedures for Small Scale CDM Project Activities §31	OK	

**Table 2 Requirements Checklist**

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
<b>A. General Description of Project Activity</b>					
<b>A.1. Title of Small-Scale Project Activity</b>					
A.1.1. Does the used project title clearly enable to identify the unique CDM Activity ?	PDD A.1	DR, I	Yes. Project title: Bundled Hadong-Busan Photovoltaic Power Project of the Korea Southern Power Corporation (1MW Hadong Photovoltaic Power + 0.39 MW Busan Photovoltaic Power, Bundling Project) The project title reflected bundling, location and energy source of the project. So that, it was clearly identified.	Pending	OK
A.1.2. Are there any indication concerning the revision number and the date of the revision ?	PDD A.1	DR	Yes, properly mentioned in A.1 It is initially review on Version 01, 06 May 2009 The current revision is version 07, 15 April 2010	Pending	OK
A.1.3. Is this in consistency with the time line of the project's history ?	PDD	DR	Yes, it is.	OK	OK
<b>A.2. Description of the Small-Scale Project Activity.</b>					
A.2.1. Is the purpose of the project activity clearly described ?	PDD A.2	DR	Yes, the information on the purpose of the project activity, type of technology has been described in PDD section A.2	OK	OK
A.2.2. Is all information provided in compliance with actual situation or planning ?	PDD A.4.1.4	DR, I	To be confirmed during on-site assessment. Yes it is. CL 03 Please add number of inverter in order to identify the capacity of inverter in the table A-2. ex) 250KW 250KW → 250KW X 5 (1 for stand-by) PP Response; Revised the number of inverter in order to identify the capacity of inverter in the table A-2.	GL-03	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
A.2.3. Is all information provided consistent with details provided in further chapters of the PDD ?	PDD	DR	<p>The information given in the PDD is all consistent in the further chapter.</p> <p>CAR 05</p> <ul style="list-style-type: none"> <li>- The expected GHG emission reduction and the generated electricity in A2 are in discord with those of B.6.3</li> <li>- Number of Module is not match with the actual situation. Hadong PV: 160 W X 6,256 pieces → 160 W X 6,240 pieces</li> </ul> <p>PP Response</p> <p>We revised the expected GHG emission reduction and the generated electricity in A.2 and B.6.3. And also No. of Module is revised with 6,240 pieces.</p>	CAR-05	OK
			<p>CL 02</p> <p>Variables used in PDD are differently described with each other.</p> <p>PP Response</p> <p>We consistently revised the variables used in PDD</p>	CL-02	OK
			<p>CL 06</p> <p>Please revise expression and typing error for followings;</p> <p>ex) 1) KPX procedure → Act on operation of electricity market.</p> <p>2) automatically → electronically</p> <p>3) audit → monitor</p> <p>4) energy generated from wind power</p> <p>PP Response:</p> <p>Revised the expression and typing error of PDD and reviewed additionally.</p>	CL-06	OK
A.2.4. Is there other environmental or social benefits excluding GHG emission reduction in the project ?	PDD A.2	DR	<p>Yes, the project will have all inherent benefits of a renewable energy project and including belows;</p> <ul style="list-style-type: none"> <li>- diversity of electric generation</li> </ul>	OK	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
			<ul style="list-style-type: none"> <li>- one of the model cases as PV power plant that utilizes solar energy.</li> <li>- transfer of the advanced solar power technology</li> <li>- job opportunities directly or indirectly through construction and operation of the plant</li> </ul>		
A.2.5. Is there any adverse environmental or social effects in the project ?	PDD A.2	DR	No, the project aims to generate electricity from the photovoltaic power and feed it into the grid. Thus, there is no adverse environmental or social effects.	OK	OK
A.2.6. Is the project in compliance with relevant legislation in the host country ?	PDD A.2	DR, I	To be confirmed during on-site visit. KSA Validation team confirmed the license for electricity generation and a written permission by the 'Electricity Enterprises Act' related to the proposed project activity.	Pending	OK
A.2.7. Does the project contribute to sustainable development of the host country from environmental, social and economic perspectives ?	PDD A.2	DR	<p>Yes, the LoA of the host country, Republic of Korea, clearly presents a statement that this project activity contribute to the sustainable development in Korea.</p> <p>CL 04 Please address the contribution to sustainable development of Korea from the social, the environmental and the economic perspectives.</p> <p>PP Response We added at section A.2 of the PDD</p>	CL-04	OK
<b>A3. Project Participants</b>					
A.3.1. Is the table required for the indication of project participants correctly applied ?	PDD A.3	DR	<p>Yes, the table under section A.3 is correctly applied.</p> <ul style="list-style-type: none"> <li>- Host Party, Republic of Korea : The Korea Southern Power Co., Ltd. (KOSPO)</li> <li>- Annex I Party has not identified yet.</li> </ul>	OK	OK



Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
A.3.2. Is all information provided in consistency with details provided by further chapters of the PDD (in particular Annex I)	PDD	DR	Yes, the information is in consistency throughout the PDD	OK	OK
A.3.3. Have the project received the written approval of voluntary participation from the designated national authorities of each Party involved, including confirmation by the host party that the project activity assists it in achieving sustainable development ?	PDD A.3	DR	To be confirmed <del>The project participant has not submitted the written approvals of voluntary participation.</del> The project participant has submitted the written approvals of voluntary participation.	Pending	OK
<b>A4. Technical description of the small-scale project activity</b>					
A.4.1. Are the project's geographical boundaries clearly described ?	PDD A.4.1.4	DR, I	Yes, details of physical location with GPS coordinates have been provided in the PDD section A.4.1.4 To be confirmed during on-site assessment. Hadong Power Plant Latitude of 34°57'16"N and Longitude of 127°49'26"E Busan Power Plant : Latitude of 35°05'14"N and Longitude of 128°59'56"E It was confirmed during on-site assessment and by Google Earth.	OK	OK
A.4.2. Does the project qualify as a small-scale CDM project activity as described in paragraph 6 (c) of decision 17/CP.7 on the modalities and procedures for the CDM ?	PDD A.4	DR	Yes, the proposed project is a photovoltaic power plants with a maximum output capacity of 1.39 MW <sub>e</sub> which is less than the 15MW <sub>e</sub> capacity limit specified for type I.D. small scale CDM.. Type and category of the proposed project can confirmed as follows; - Type I : Renewable Energy Projects - Category D : Grid connected renewable electricity generation.	OK	OK
A.4.3. Are the project's system (components and facilities used to mitigate GHG's) boundaries clearly defined?	PDD A.4	DR	Yes, the components of each photovoltaic power plant include the photovoltaic module, inverter and transformer. For calculation of the baseline grid emission factor the power	OK	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
			plants generating and exporting to the KEPCO grid are selected as the electricity system boundary.		
A.4.4. Does the project design engineering reflect current good practices?	PDD A.4	DR, I	<ul style="list-style-type: none"> <li>▪ The capacity of Busan PV power plant is 389.96 KWe (0.39MWe) and details are as followings ;</li> <li>◦ One of the solar cell module model is SM-200AP0, multi-crystalline silicone by S-energy Co., Ltd. (<a href="http://www.s-energy.co.kr">http://www.s-energy.co.kr</a>) <ul style="list-style-type: none"> <li>- 170 W<sub>p</sub> X 1,428 pieces = 242.76 KW<sub>e</sub></li> <li>- SM-200AP0 was certified as new &amp; renewable energy in accordance with MKE Announcement No. 2007-160 by New &amp; Renewable Energy Center (NREC) (Certificate No.: PV-CPM-1-0025) (<a href="http://www.knrec.or.kr/NA/NA202000_5_9.jsp">http://www.knrec.or.kr/NA/NA202000_5_9.jsp</a>)</li> </ul> </li> <li>◦ The other solar cell module Model is KPEM-170A72, mono-crystalline silicone by KPE(<a href="http://www.psec.co.kr">http://www.psec.co.kr</a>) <ul style="list-style-type: none"> <li>- 200 W<sub>p</sub> X 736 pieces = 147.20 KW<sub>e</sub></li> </ul> </li> <li>▪ The capacity of Hadong PV power plant is 998.4 KW<sub>e</sub> (1.0MWe) and details are as followings ;</li> </ul> <p>The solar cell modules is mono-crystalline silicone by KPE(<a href="http://www.psec.co.kr">http://www.psec.co.kr</a>)</p> <ul style="list-style-type: none"> <li>- 160 W<sub>p</sub> X 6,240 pieces = 998.4 KW<sub>e</sub></li> </ul> <p>* KPE is a renowned technology-intensive leader in the PV industry, the largest and first commercialized solar cell manufacturer in the Republic of Korea.</p>	Pending	OK
A.4.5. Are the project environmental safe and sound technology and result in technology transfer to	PDD A.4	DR, I	To be confirmed during on-site assessment. The project activity generates electricity with using countless	Pending	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
the host country?			insolation from sun, there are no severe impact of environment. Accordingly, the adopted technology to this project is environmentally safe and sound.		
A4.6 Are the GHGs emissions reductions additional to what would occur in the absence of the project ?	PDD	DR	The solar power energy is a renewable clean energy which is not emitting GHG. This project can displace the electricity which is generated by a fossil fuel power plant. So that, the GHG emission reduction are additional to what would occur in the absence of the project.	OK	OK
A.4.7. Does the project require extensive initial training and maintenance efforts in order to work as presumed during the project period? Does the project make provisions for meeting training and maintenance needs?	PDD A.4	DR, I	To be confirmed during on-site assessment. The project does not require extensive training since the technology is not new, but training on the operation and maintenance is provide by the equipment manufacturer. And KOSPO is sufficiently competent for PV generation.	Pending	OK
A.4.8. Does the project design clearly and consistently indicate the chosen crediting period, the total estimation of emission reductions for the chosen crediting period ?	PDD A.4	DR	Yes, the length of the crediting period is 10 years and the total estimated reductions is 1,078 tones of CO <sub>2eq</sub> per year throughout the crediting period.	OK	OK
A.4.9. How is it ensured and/or demonstrated, that the project proponents can implement the project at this site (ownership, licenses, contract etc. ?	PDD A.4	DR, I	This project activity is implemented by the project participants and can be demonstrated by business license. The license is confirmed during on-site assessment. Project participants have been recognized both construction and electric business for PV power plant. KSA confirmed the electric business permit for PV power plant by the local government office.	Pending	OK
<b>A.5. Public Funding</b>					
A.5.1. Does the information on public funding provided conform to the actual situation or planning as presented by the project participants ?	PDD A.4.4	DR, I	No indication that any public funding is involved.	Pending	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
<b>A.6. Debundling</b>					
A.6.1. Is the small-scale project activity a debundled component of a large scale project activity ?	PDD A.4.5	DR, I	The proposed project is not a debundled component of a larger project activity. Because there is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity within 1 km of the project boundary.	Pending	OK
<b>B. Baseline and monitoring methodology</b>					
<b>B.1 Applicability of selected methodology to the project activity.</b>					
B.1.1 Is the methodology correctly quoted and applied by comparing it with the actual text of the applicable version of the methodology available on the UNFCCC CDM web site.	PDD B.1	DR	Yes, <ul style="list-style-type: none"> <li>Version 15 of "AMS.I.D" (Grid connected renewable electricity generation) is applied to the proposed project.</li> <li>Baseline emission factor is calculated by "Tool to calculate the emission factor for an electricity system" (Ver01.1)</li> </ul>	OK	OK
B.1.2 Does a selected approved methodology applies to the project activity in which the applicability conditions of the methodology are met and the project activity is not expected to result in emissions other than those allowed by the methodology.	PDD B.2	DR	Yes, the selected baseline methodology refers to project type I (Renewable Energy Projects) and project category D (Grid connected renewable electricity generation) according to Appendix B of Annex II 'Simplified modalities and procedures for small-scale CDM project activities'. The proposed project activity is as follows : <ul style="list-style-type: none"> <li>Maximum output capacity is 1.39 MW<sub>e</sub> by solar energy, one of renewable energies.</li> <li>the electricity generated by PV power plant is grid connected.</li> </ul> Thus, the methodology of AMS-I.D is applicable to the proposed project. CL 01	CL-01	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
			Please clearly describe in PDD whether the project activity qualify as a small scale CDM.  PP Response Described the qualification of the project activity as a small scale CDM in the PDD.		
B.1.3 Is the choice of methodology justified and the project participants have shown that the project activity meets each of the applicability conditions of the approved methodology or any tool or other methodology component referred to therein ?	PDD B.2	DR	Refer B.1.2. The choice of the approved methodology is justified to the proposed project activity.	OK	OK
B.1.4 Is the documentation referred to in the PDD and by verifying that its content correctly quoted and interpreted in the PDD.	PDD B.2	DR	Refer B.1.2.	OK	OK
B.1.5 If comparable information is available from sources other than that used in the PDD, cross check the PDD against the other sources to confirm that the project activity meets the applicability conditions of the methodology.	PDD B.2	DR	Refer B.1.2.	OK	OK
<b>B.2 Project boundary</b>					
B.2.1 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	The spatial extent of the proposed project boundary includes the project sites and all power plants physically connected to electricity system of KEPCO.	OK	OK
B.2.2 Based on documented evidence and	PDD	DR, I	To be confirmed during on-site visit	Pending	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
corroborated by a site visit where required by section A.2.1 above, is the delineation in the PDD of the project boundary correct and meets the requirements of the selected baseline methodology ?	B.3		Yes, it is.		
B.2.3 Have all sources and GHGs required by the methodology been included within the proposed project boundary.	PDD B.3	DR, I	To be confirmed during on-site visit According to baseline methodology, the project boundary encompasses the physical, geographical site of the renewable generation which covers PV generator and relevant accessory equipments.	Pending	OK
B.2.4 In case that the methodology allows project participants to choose whether a source or gas is to be included within the project boundary, have the project participants justified that choice ?	PDD B.3	DR, I	No, it does not emit GHG emission because the project is a photovoltaic power plant. GHG emission from the project boundary does not included emission during plant construction, leakage from electricity transfer and emission from transportation, mining, and pumping.	Pending	OK
<b>B.3 Baseline identification</b>					
B.3.1 What is the baseline scenario ? Has the baseline scenario been determined according to the chosen methodology ?	PDD B.4	DR	Baseline is determined according to AMS I.D. para 7. Baseline is the KWh produced by the renewable generating unit multiplied by an emission coefficient (measured in $tCO_2/yr$ ) calculated in a transparent and conservative manner as a CM(combined margin) consist of OM(operating margin) and BM(build margin) according to 'Tool to calculate the emission factor for an electricity system' $BE_y = EG_{BL-y} * EF_{CO_2}$	OK	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
			<p>where</p> <p><math>BE_y</math> = Baseline Emissions in year y; <math>tCO_2</math></p> <p><math>EG_{BL-y}</math> = Energy baseline in year y; MWh</p> <p><math>EF_{CO_2}</math> = <math>CO_2</math> Emission Factor in year; <math>tCO_{2e}/MWh</math></p>		
B.3.2 Is the baseline scenario identified reasonable by validating the assumptions, calculations and rationales used, as described in the PDD ?	PDD B.4	DR, I	<p>The baseline of the proposed project is the renewable energy to the grid system. There is no GHG emission in the photovoltaic power plant. Thus the emission reductions are equal to the baseline emission.</p> <p>And this project activity displaced the electricity which is generated by a fossil fuel power plant.</p>	OK	OK
B.3.3 Are documents and sources referred to in the PDD correctly quoted and interpreted.	PDD B.4	DR	Yes, it is.	OK	OK
B.3.4 Are the information provided in the PDD with other verifiable and credible sources cross checked, such as local expert opinion, if available ?	PDD B.4	DR	<p>The power sector data used for calculation has been cross-checked with the information provided in PDD and "Statistics of Electric Power in Korea" (<a href="http://www.kepco.co.kr">http://www.kepco.co.kr</a>)</p> <p>As the results of comparing data with "Statistics of Electric Power of in Korea", raw data found satisfactory</p> <p>CAR 02</p> <p>Baseline emission have not been accounted for using the most recently available data.</p> <p>PP Response</p> <p>Baseline emissions are re-calculated using 2006 to 2008 electricity generation data.</p>	CAR-02	OK
B.4 Additionality of a project activity					

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
B.4.1 Are the reliability and credibility of all data, rationales, assumptions, justifications and documentation provided by project participants to support the demonstration of additionality, assessed and verified ?	PDD B.5	DR, I	<p>According to 'Attachment A to Appendix of the simplified modalities and procedures for small-scale CDM project activity', the determination of project scenario additionality shall be performed explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers;</p> <ul style="list-style-type: none"> <li>- investment analysis</li> <li>- technological barrier</li> <li>- barrier due to prevailing practice</li> <li>- other barrier</li> </ul> <p>The project developer applied with investment barrier to assess the additionality. KSA re-checked raw data through confirming the following website.</p> <ul style="list-style-type: none"> <li>- Check SMP (system margin price) at <a href="http://epsis.kpx.or.kr">http://epsis.kpx.or.kr</a></li> <li>- Exchange rate at <a href="http://www.keb.co.kr">http://www.keb.co.kr</a></li> <li>- Secondary CERs price at <a href="http://www.pointcarbon.com">http://www.pointcarbon.com</a></li> </ul> <p>The results of financial analysis to assess additionality, the NPVs were much lower than 0 and IRR is minus which means negative.</p> <p>It has been verified from NPV and IRR calculation attached with the PDD that the returns from the project in the absence of the benefits from CDM are not attractive enough for the project proponent to go forward with the project.</p> <p>So, the proposed project activity is not financially attractive or feasible. Thus it has been established that the project activity would not have occurred in the absence of CDM and is hence additional.</p>	OK	OK



Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
			<p>CAR 03</p> <ul style="list-style-type: none"> <li>- The information on NPV analysis not sufficiently supported by evidence;</li> <li>ex) - the depreciation cost <ul style="list-style-type: none"> <li>- initial costs</li> <li>- discount rate</li> </ul> </li> <li>- Validation team found that there are few errors in calculation of NPV analysis ; <ol style="list-style-type: none"> <li>1) Present value factor is not considered at cash flow.</li> <li>2) not considered scrap value of photovoltaic power plants.</li> </ol> </li> </ul> <p>PP Response</p> <p>NPV is re-calculated considering for follows;</p> <ul style="list-style-type: none"> <li>- Initial investment cost are corrected in accordance with the purchasing contract for photovoltaic modules and inverters, construction contract and other documentary</li> <li>- the depreciation cost is applied the tax law of host country, Korea.</li> <li>- discount rate is applied the in internal discount rate of KOSPO.</li> </ul> <p>NPV is re-calculated using cash flow which has considered present value factor and the scrap value of PV.</p>	CAR-03	OK
B.4.2 Are the presented evidence, using local knowledge and sectoral and financial expertise critically assessed ?	PDD B.5	DR	Refer to Section B.4.1 above.	OK	OK
B.4.3 Are tools and documents provided by the CDM Executive Board to demonstrate the additionality of proposed CDM project activities, as well as specific complementary or alternative	PDD B.5	DR	Refer to Section B.4.1 above.	OK	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
requirements included in approved CDM methodology, considered ?					
B.4.4 Are all assumptions stated in a transparent and conservative manner?	PDD B.5	DR	Refer to Section B.4.1 above.	OK	OK
B.4.5 It is appropriately explained that the proposed CDM activity faces the barriers that prevent the implementation of the project activity but not the implementation of at least one of the possible alternatives.	PDD B.5	DR	Refer to Section B.4.1 above.	OK	OK
B.5 Prior consideration of the clean development mechanism					
B.5.1 Is the start date of the project activity, reported in the PDD, in accordance with the "Glossary of CDM terms"?	PDD B.5	DR, I	It will be confirmed during on-site assessment on the basis of 'Glossary of CDM terms (version 4)'. The starting date of this project is identified as the contract date for construction of the site. Hadong PV Power : 17 March 2008 Busan PV Power : 26 March 2008 KSA Validation team confirmed the contract documents and found satisfactory.	Pending	OK
B.5.2 Is the proposed project appropriate for the prior consideration of the CDM	PDD B.5	DR	KSA validation team confirmed the relevant documents for prior consideration as following; ▪ "Memorandum of understanding CDM consulting" between KOSPO and Ecoey Co., Ltd. dated on 13 September 2005 which is on page 19 of PDD. * Ecoeye is a renowned CDM consulting leader in		OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
			<p>the Republic of Korea.</p> <ul style="list-style-type: none"> <li>Investment Analysis of Hadong PV power plant CDM Project. <ul style="list-style-type: none"> <li>Basic Plan establishment of PV power plant</li> </ul> </li> <li>Investment Analysis of Busan PV power plant CDM Project. <ul style="list-style-type: none"> <li>Feasibility review and establishment planning PV power plant</li> </ul> </li> </ul> <p>* The KOSPO mentioned CDM business developing and registration at those report. And also, the KOSPO discussed and considered CDM CERs and "Act on the Promotion of Development, Use and Diffusion of New and Renewable Energy" (enacted in 2002) at this report.</p> <p>※ This law is intended to improve the profitability and promote investment on renewable energy projects through preferential treatment for the electricity prices because in Korea, investing on those renewable energy projects is not much activated due to the high cost and low return of those kinds of projects.</p> <p>According to decision of 22nd EB meeting, it need not be taken into account in developing a baseline scenario. So, the law is not considered in baseline.</p> <p>CAR 04 The additional information relevant prior consideration for the CDM shall be described in the PDD</p>	GAR-04	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
			PP Response The additional information for prior consideration for CDM are added for followings; - Memorandum of understanding CDM consulting - Investment analysis of Hadong PV power plant and Busan PV power plant.		
B.6 Emission reductions					
B.6.1 B.4.1 Have the equations and parameters in the PDD been correctly applied by comparing them to those in the selected approved methodology.	PDD B.6	DR	The calculation of the emission reduction is correctly applied the approved methodology, AMS I.D. (version 15)	OK	OK
B.6.2 Is the selection of options offered by the approved methodology correctly identified ?	PDD B.6	DR	N/A, there is no option offered by the approved methodology.	OK	OK
B.6.3 Are the formulae required for the calculation of the proposed project emission reduction presented correctly ?	PDD B.6	DR	Yes, the formulae to calculate the emission reduction are correctly described in the PDD.  CAR 01 The estimated emission reduction and investment analysis shall be based on the design value of PV module efficiency and inverter efficiency.  PP Response The emission reduction and investment analysis were calculated by data based on the design value of PV module efficiency and inverter efficiency.	CAR-01	OK
B.6.4 Is the form/table required for the indication of projected emission reductions correctly applied ?	PDD B.6	DR	Yes, all data and parameters are listed in the chapter B.6.2 of PDD.	OK	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
B.6.5 Is the choice of ex-ante or ex-post vintage of emission factors specified clearly in the PDD ?	PDD B.6	DR	The ex-ante option was applied as a vintage of emission factors in the PDD.	OK	OK
B.6.6 Are the formulae required for the determination of baseline emission correctly described ?	PDD B.6	DR	Yes, formulae to calculate the baseline emission of this project are correctly described in the PDD	OK	OK
B.6.7 Are the formulae required for the determination of leakage emission correctly described ?	PDD B.6	DR	It does not emit GHG as the project is a photovoltaic power plant. So, there are no formulae for calculation of direct emissions.	OK	OK
B.6.8 Will the project results in fewer GHG emissions than baseline scenario ?	PDD B.6	DR	Yes, estimation of emission reduction by this project activity is 1,078 tCO <sub>2</sub> /yr.	Pending	OK
B.6.9 Is the projection in line with the envisioned time schedule for the project's implementation and the indicated crediting period?	PDD B.6	DR	Yes, it is.	OK	OK
B.6.10 Is the data provided in this section in consistency with data as described in other chapter of the PDD ?	PDD B.6	DR	Yes, the data are consistent.	OK	OK
B.7 Application of the monitoring methodology and description of the monitoring plan					
B.7.1 Data and parameters monitored					
B.7.1.1 Is it identified the list of parameters required by the selected approved methodology ?	PDD B.7	DR	Yes, all data and parameters are listed in the chapter B.6.2 of PDD.  CL 05	CL-05	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
			Please added the omitted expression of data/parameter in the table B.6.2 and B.7.1 of PDD.  PP Response Added the omitted expression of data/parameter in the table B.6.2 and B.7.1 of PDD.		
B.7.1.2 Does the monitoring plan contains all necessary parameters, that they are clearly described and that the means of monitoring described in the plan complies with the requirements of the methodology ?	PDD B.7	DR, I	Measurement methods and procedures to be applied (Monitoring, data type, archiving procedures, recording frequency and responsible person(s) / entity (ies) and etc) are clearly described in the PDD  CAR 07 According to "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories (EB41th Report Annex 20)", electricity meter shall be recalibrated within 3 years. But the periodic calibration of meter was stipulated with one time per 3 and a half year.  PP Response We revised B.7.1 of PDD within 3 years instead of 3 and a half year.	CAR-07	OK
B.7.2 Description of the monitoring plan					
B.7.2.1 Are the monitoring arrangements described in the monitoring plan feasible within the project design ?	PDD B.7	DR	The monitoring and reporting of electricity generation will be undertaken electronically and cross checked with electricity sales receipt.  CAR 06 Monitoring plan does not address explicitly auxiliary use power consumed by PV system.  PP Response	CAR-06	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
			The amount of electricity consumed in the plant and electricity transmission to a grid will be measured and deducted from the emission reduction of the proposed project according to the monitoring.		
B.7.2.2 Does the monitoring methodology reflect good monitoring and reporting practices ?	PDD B.7	DR	Yes, it is. The sales receipts and agreements (parallel operation and power purchase agreements) between the project owner and the grid company (KPX) are used for cross checking.	OK	OK
B.7.2.3 Are the means of implementation of the monitoring plan, including the data management and quality assurance and quality control procedures, sufficient to ensure that the emission reductions achieved by/resulting from the proposed CDM project activity can be reported ex-post and verified ?	PDD B.7	DR, I	<p>Yes, the means of implementation of the monitoring plan is appropriately described in the section B.7.2 of the PDD as followings..</p> <ul style="list-style-type: none"> <li>- The authority and responsible for operation, monitoring, archiving and reporting of the project activity is clearly described in the section B.7.2 of the PDD.</li> <li>- QA/QC procedures are including periodic calibration of monitoring equipments, relevant laws and standards of Korea, measuring method and frequency, and contingency plan.</li> </ul> <p>CL 08 QA/QC of the monitoring plan; 1) please add the contingency plan. 2) please submit a manual for operation, maintenance and monitoring.</p> <p>PP Response Contingency plan ;</p> <ul style="list-style-type: none"> <li>- In case of measurement equipment trouble or data transferring error, the person in charge is responsible for prompt grasping the problem and restoring it in due course.</li> <li>- While restoring, KOSPO converts generated electricity rate which does not include internal consumption and transmission loss into transmitted electricity rate and KPX verifies it.</li> </ul>	CL-08	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)					
B.8.1 Is it indicated a date of when baseline and monitoring methodology is determined?	PDD B.8	DR	Yes, the first version of PDD to KSA was determined on 06 May 2009.	OK	OK
B.8.2 Is information on the responsible person(s) / entity(ies) provided ?	PDD B.8	DR	Yes, the information on the responsible person 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 lifetime clearly defined and evidenced ?	PDD C.1	DR, I	<ul style="list-style-type: none"> <li>- The starting date has been set as date of contract for construction of the PV plant on 17 March 2008 and 26 March 2008 Hadong PV power and Busan PV power respectively.</li> <li>- The expected operational lifetime of those PV plant will be 20 years over.</li> </ul>	OK	OK
C.2 Is the assumed crediting time clearly defined (renewable crediting period of max 7 years with two possible renewable or fixed crediting period of max 10 years with no renewal)?	PDD C.1	DR	Yes, fixed crediting period of maximum 10 years without a renewal is selected.	OK	OK
C.3 Is the start of the crediting period clearly defined ?	PDD C.1	DR	Yes, the starting date of the first crediting period will be the date of registration of the project.	OK	OK
<b>D. Environmental Impacts.</b>					



Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
D.1 If an environmental impact assessment (EIA) is required by the host Party, have the project participants undertaken an analysis of environmental impacts ?	PDD D.1	DR	<p>According to the Korean Environmental Law, the project participant has to perform the EIA only if the capacity of photovoltaic power plant is over 100MW. The capacity of the proposed project is 1 MW and 0.39 MW respectively, thus, this project activity does not apply to EIA.</p> <p>But Hadong PV was built in the Hadong Thermal Plant which had performed EIA. Thus, existing EIA was required to amend EIA owing to change existing power plant usage condition.</p> <p>The EIA were carried out on climate, water quality, noise, and natural ecosystem related to the usage change of real estate for new PV power plant construction.</p> <p>The conclusion of the report showed that there are no any significant environmental impact for the Hadong PV power plant.</p>	Pending	OK
D.2 Has an analysis of the environmental impacts of the project activity been sufficiently described ?	PDD D.1	DR, I	Refer to Section D.1.	Pending	OK
D.3 Will the project create any adverse environmental effects ?	PDD D.1	DR, I	No, adverse environmental effects are not created.	Pending	OK
D.4 Are transboundary environmental impacts considered in the analysis ?	PDD D.1	DR, I	There are no transboundary environmental impacts.	Pending	OK
D.5 Have environmental impacts been identified and addressed in the PDD ?	PDD D.1	DR	Not applicable, since there are no adverse environmental effects related to the proposed project.	OK	OK
D.6 Does the project comply with environmental legislation or law in the host country ?	PDD D.1	DR	Yes, Refer to Section D.1	OK	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
<b>E. Stakeholder's Comments. Local stakeholders shall be invited by the PPs to comment on the proposed project activity.</b>					
E.1 Have relevant stakeholders been consulted?	PDD E.1	DR, I	<p>Yes, the local government, NGO, resident nearby PV plant and worker are identified as a stakeholder of this projects. The stakeholder consultation for the project activity were carried out by KOSPO website (<a href="http://www.kospo.co.kr">http://www.kospo.co.kr</a>) and town meetings on March 2008.</p> <p>Owing to both Hadong PV and Busan PV were installed inside of the factory, there are no local residents near by the PV power plant.</p> <p>But project proponent informed to the local resident about the information of installation of PV and found that there are no objection or arguments from identified stakeholder</p> <p>CL 07 Attached &lt;Figure E-3&gt; and explanation relevant stakeholder's comments are not matched.</p> <p>PP Response We matched the figure and explanation for relevant stakeholder's comments.</p>	CL-07	OK
E.2 Have appropriate media been used to invite comments by local stakeholders?	PDD E.1	DR	<p>Through the KOSPO website and town meeting, invite local stakeholder's comments on the proposed project activity. KSA validation team interviewed as follows;</p> <p>- For Busan PV power, the chief of town (dong) and president of NGOs (Environment Guard, <a href="http://www.envnews.com">http://www.envnews.com</a>) and found that there are no objection.</p>	OK	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
			- For Hadong PV power, local residents nearby PV power and NGO member ( <a href="http://www.knccn.org">http://www.knccn.org</a> ) and found that there are no objection.		
E.3. If a stakeholder consultation process is required by regulation/law in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/law?	PDD E.1	DR	There are no regulations/laws in the Republic of Korea for carrying out the stakeholder consultation process for this project activity.	Pending	OK
E.4. Is a summary of the stakeholder comments received provided?	PDD E.1	DR	Yes, summary of the comments received has been provided.	OK	OK
E.5. Has due account been taken of any stakeholder comments received ?	PDD E.1	DR	No adverse comments received.	OK	OK

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

No. of CAR/CL	Description of the CAR/CL	Ref.	Comments/Response from project proponent	Conclusions
CAR 01	The estimated emission reduction and investment analysis shall be based on the design value of PV module efficiency and inverter efficiency.	PDD B.5 and B.6  Table 2 B.6.2	The emission reduction and investment analysis were calculated by data based on the design value of PV module efficiency and inverter efficiency.	It is appropriately calculated the emission reduction and investment analysis. So, CAR01 is checked and satisfied. It was reflected in the B.5 and B.6 of PDD CAR 01 is closed.
CAR 02	Baseline emission have not been accounted for using the most recently available data.	PDD B.4.  Table 2 B.3.4	Baseline emissions are re-calculated using 2006 to 2008 electricity generation data.	It is accounted for using most recently available data. So, CAR02 is checked and satisfied, It was reflected in the B.4 of PDD. CAR 02 is closed.
CAR 03	The information on NPV analysis not sufficiently supported by evidence; ex) - the depreciation cost - initial costs - discount rate  Validation team found that there are few errors in calculation of NPV analysis ; - Present value factor is not considered at cash flow. - not considered scrap value of photovoltaic power plants.	PDD B.5  Table 2 B.4.1	NPV is re-calculated considering for follows; - Initial investment cost are corrected in accordance with the purchasing contract for photovoltaic modules and inverters, construction contract and other documentary - the depreciation cost is applied the tax law of host country, Korea. - discount rate is applied the in internal discount rate of KOSPO.  NPV is re-calculated using cash flow which has considered present value factor and the scrap value of PV.	The information on NPV analysis were sufficiently supported by evidence and errors in calculation of NPV analysis were revised. So, CAR 03 is checked and satisfied. It was reflected in the B.5 of PDD. CAR 03 is closed.

No. of CAR/CL	Description of the CAR/CL	Ref.	Comments/Response from project proponent	Conclusions
CAR 04	The additional information relevant prior consideration for the CDM shall be described in the PDD	PDD B.5  Table 2 B.5.2	The additional information for prior consideration for CDM are added for followings; - Memorandum of understanding CDM consulting - Investment analysis of Hadong PV power plant and Busan PV power plant.	The additional information relevant prior consideration for the CDM are described in the PDD. So, CAR 04 is checked and satisfied. It was reflected in the B.5. of PDD. CAR 04 is closed.
CAR 05	- The expected GHG emission reduction and the generated electricity in A2 are in discord with those of B.6.3 - Number of Module is not match with the actual situation. Hadong PV: 160 W × 6,256 pieces → 160 W × 6,240 pieces	PDD A.2/B.6.3  Table 2 A.2.3	We revised the expected GHG emission reduction and the generated electricity in A.2 and B.6.3  And also No. of Module is revised with 6,240 pieces.	It is correctly revised. CAR05 is checked and satisfied. It was reflected in the A.2 and B.6.3 of PDD. CAR 05 is closed.
CAR 06	Monitoring plan does not address explicitly auxiliary use power consumed by PV system.	PDD B.7.2  Table 2 B.7.2.1	The amount of electricity consumed in the plant and electricity transmission to a grid will be measured and deducted from the emission reduction of the proposed project according to the monitoring.	It is revised as the amount of total net electricity generation. So, CAR 06 is checked and satisfied. It was reflected in the B.7.2 of PDD. CAR 06 is closed.
CAR 07	According to "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories (EB41th Report Annex 20)", electricity meter shall be recalibrated within 3 years. But the periodic calibration of meter was stipulated with one time per 3 and a half year.	PDD B.7.1  Table 2 B.7.1.2.	We revised B.7.1 of PDD within 3 years instead of 3 and a half year.	It is correctly revised in the PDD CAR07 is checked and satisfied. It was reflected in the B.7.1 of PDD. The CAR 07 is closed.
CL 01	Please clearly describe in PDD whether the project activity qualify as a small scale CDM.	PDD B.2  Table 2 B.1.2.	Described the qualification of the project activity as a small scale CDM in the PDD.	OK CL 01 is checked and satisfied. It was reflected in the B.2 of PDD. CL 01 is closed.

No. of CAR/CL	Description of the CAR/CL	Ref.	Comments/Response from project proponent	Conclusions
CL 02	Variables used in PDD are differently described with each other.	PDD B.4 ~ B.7  Table 2 A.2.3.	We consistently revised the variables used in PDD	OK CL 02 is checked and satisfied. It was reflected in the B.4 ~ B.7 of PDD. CL 02 is closed.
CL 03	Please add number of inverter in order to identify the capacity of inverter in the table A-2. ex) 250KW 250KW → 250KW X 5 (1 for stand-by)	PDD A.4.2.  Table 2 A.2.2	Revised the number of inverter in order to identify the capacity of inverter in the table A-2.	OK CL 03 is checked and satisfied. It was reflected in the A.4.2 of PDD. CL 03 is closed.
CL 04	Please address the contribution to sustainable development of Korea from the social, the environmental and the economic perspectives.	PDD A.2  Table 2 A.2.7.	We added at section A.2 of the PDD	OK CL 04 is checked and satisfied. It was reflected in the A.2 of PDD. CL 04 is closed.
CL 05	Please added the omitted expression of data/parameter in the table B.6.2 and B.7.1 of PDD.	PDD B.6/B.7  Table 2 B.7.1.1	Added the omitted expression of data/parameter in the table B.6.2 and B.7.1 of PDD.	OK CL 05 is checked and satisfied. It was reflected in the B.6/B.7 of PDD. CL 05 is closed.
CL 06	Please revise expression and typing error for followings; ex) 1) KPX procedure → Act on operation of electricity market. 2) automatically → electronically 3) audit → monitor 4) energy generated from wind power 5) etc	all in PDD  Table 2 A.2.3.	Revised the expression and typing error of PDD and reviewed additionally.	OK CL 06 is checked and satisfied. It was reflected throughout the PDD. CL 06 is closed.
CL 07	Attached <Figure E-3> and explanation relevant stakeholder's comments are not matched.	PDD E.2  Table 2 E.1.	We matched the figure and explanation for relevant stakeholder's comments.	OK CL 07 is checked and satisfied. It was reflected in the E.2 of PDD. CL 07 is closed.

No. of CAR/CL	Description of the CAR/CL	Ref.	Comments/Response from project proponent	Conclusions
CL 08	QA/QC of the monitoring plan; 1) please add the contingency plan. 2) please submit a manual for operation, maintenance and monitoring.	PDD B.7.2.  Table 2 B.7.2.3	Contingency plan ; - In case of measurement equipment trouble or data transferring error, the person in charge is responsible for prompt grasping the problem and restoring it in due course. - While restoring, KOSPO converts generated electricity rate which does not include internal consumption and transmission loss into transmitted electricity rate and KPX verifies it.	OK CL 08 is checked and satisfied. It was reflected in the B.7.2 of PDD. CL 08 is closed.

## **APPENDIX B**

### **CERTIFICATE OF COMPETENCE**





## **GHG Validator/Verifier Certificate**

Kyoo-Il Sohn

Certificate No. : CDM-001

Sectoral Scope : 01, 05

Expert Scope : 01

Korean Standards Association hereby certifies that the above person is qualified by KSA's Qualification requirements to conduct validation and verification for CDM and GHG project.

**VALID FROM**

2008.4.22

**VALID UNTIL**

2011.4.21

**PRESIDENT OF KSA**

A handwritten signature in black ink, appearing to read "Kaphong Choo", is written over a faint, larger handwritten signature that also appears to read "Kaphong Choo".

**KOREAN STANDARDS ASSOCIATION**

13F, Ace High-end Tower 3, 371-50, Gasan-dong, Gwumcheon-gu, Seoul, Korea



## GHG Validator/Verifier Certificate

Ju-Dong Yeo

Certificate No. : CDM-002

Sectoral Scope : 05, 13

Korean Standards Association hereby certifies that the above person is qualified by KSA's Qualification requirements to conduct validation and verification for CDM and GHG project.

VALID FROM

2008.4.22

VALID UNTIL

2011.4.21

PRESIDENT OF KSA

A handwritten signature in black ink, appearing to read "Kaphong Choo", is written over the printed name of the President of KSA.

**KOREAN STANDARDS ASSOCIATION**

13F, Ace High-end Tower 3, 371-50, Gasan-dong, Gwumcheon-gu, Seoul, Korea



## GHG Validator/Verifier Certificate

Dong-gook Yang

Certificate No. : CDM-003

Sectoral Scope : 01, 03

Korean Standards Association hereby certifies that the above person is qualified by KSA's Qualification requirements to conduct validation and verification for CDM and GHG project.

**VALID FROM**

2008.4.22

**VALID UNTIL**

2011.4.21

**PRESIDENT OF KSA**

A handwritten signature in black ink, appearing to read "Kaphong Choo", is written over the printed name of the President of KSA.

**KOREAN STANDARDS ASSOCIATION**

13F, Ace High-end Tower 3, 371-50, Gasan-dong, Gwumcheon-gu, Seoul, Korea

# KSA

## CDM Technical Expert Certificate

Byungwook Park

Certificate No. : CDM-007

Technical Area : 1.6 renewable energy

Korean Standards Association hereby certifies that the above person is qualified by KSA's Qualification requirements as a technical expert for CDM validation and verification activities.

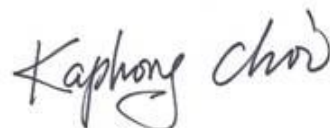
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2010.6.24

VALID UNTIL

2013.6.23

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