
VERIFICATION REPORT (rev.5)

**"GOCHANG SOLARPARK 14.98MW PHOTOVOLTAIC
POWER PLANT PROJECT" in REPUBLIC OF KOREA**

REPORT No. : 2011-09

KSA KOREAN
STANDARDS
ASSOCIATION

Table of Contents	Page
0. CERTIFICATION STATEMENT	4
1. INTRODUCTION	5
1.1 Objective	5
1.2 Scope	5
1.3 Description of the Project Activity	6
1.4 Verification Team	6
1.5. Internal Quality Control	6
2. METHODOLOGY	7
2.1 Desk Review	7
2.2 On-Site Assessment	8
2.3 Reporting Verification Findings	8
3. VERIFICATION FINDINGS	9
3.1 Remaining issues, CARs, FARs from Previous Validation or Verification	9
3.2 Project Implementation in accordance with the registered PDD	9
3.3 Compliance of Monitoring Plan with the Monitoring Methodology	12
3.4 Compliance of Monitoring with the Monitoring Plan	12
3.5 Assessment of Data and Calculation of Greenhouse Gas Emission Reduction	13
3.6 Management System and Quality Assurance	15
4. PROJECT SCORECARD	16
5. REFERENCES	17

Appendix A VERIFICATION PROTOCOL

Appendix B CERTIFICATE OF COMPETENCE

ABBREVIATIONS

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CL	Clarification Request
CO₂	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse Gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
KEPCO	Korea Electric Power Corporation
KPX	Korea Power Exchange
KSA	Korean Standards Association
MP	Monitoring Plan
MR	Monitoring Report
PDD	Project Design Document
PP	Project Participant
SSC	Small-Scale
UNFCCC	United Nations Framework Convention on Climate Change
VVM	Validation and Verification Manual

0. CERTIFICATION STATEMENT

Korean Standards Association (KSA) has performed the verification of the registered CDM project "Gochang Solarpark 14.98MW Photovoltaic Power Plant Project (UNFCCC reference no.: 3009)" in Korea for 1st monitoring period from 01/03/2010 to 31/05/2011. The verification consisted of the following three phases; i) desk review of the project design, baseline and monitoring plan; ii) on-site assessment for project implementation and interviews; iii) resolution of outstanding issues and the issuance of the final verification report and statements.

The management of the "Gochang Solarpark 14.98MW Photovoltaic Power Plant Project" in Korea is responsible for the preparation of the GHG emissions data and the reported GHG emission reductions on the basis set out within the monitoring plan indicated in the registered Project Design Document.

This verification is based on the draft Monitoring Report dated on 01/06/2011, the final Monitoring Report dated on 17/08/2012, Monitoring Plan as described in the registered PDD, revised monitoring plan approved by EB, Validation Report, emission calculation spreadsheet and supporting documents made available to KSA by the project participants. The GHG emission reductions were correctly calculated on the basis of the approved Monitoring Methodology AMS.I.D. Version 13 and the monitoring plan contained in the PDD.

Hence, Korean Standards Association certifies that the reported emission reductions from the project equated to 16,668 tCO₂-eq.

Aug 21st, 2012



Mr. JinSu Chun

*Director
International Certification Division
Korean Standards Association*



Mr. SeungKeun Choi

Verification Team Leader

1. INTRODUCTION

Korean Standards Association (KSA) has been commissioned by Gochang Solarpark Co., LTD. to carry out verification and certification of emission reductions reported from 'Gochang Solarpark 14.98MW Photovoltaic Power Plant Project' in Korea (hereafter the project) for the period from 01 Mar 2010 to 31 May 2011. This report contains the findings from this verification assignment and a certification statement for the emission reductions.

1.1 Objective

Verification is the periodic independent review and ex-post determination by the Designated Operational Entity (DOE) of the monitored reduction in GHG emissions that have occurred as a result of the registered CDM project activity during a defined verification period.

The objective of this verification work is to comply with the requirements of paragraph 62 of the CDM Modalities and Procedures. Certification is the written assurance by the DOE that, during a specified time period, a proposed CDM project activity achieved/resulted in the emission reductions in anthropogenic by sources of GHG's as verified.

1.2 Scope

Based on the applicable requirements of paragraph 62 of the CDM Modalities and Procedures, KSA shall;

- (a) Ensure that the project activity has been implemented and operated as per the registered PDD, and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place;
- (b) Ensure that the published monitoring report and other supporting documents provided are complete in accordance with latest applicable version of the completeness checklist for requests for issuance of CERs and verifiable and in accordance with applicable CDM requirements.
- (c) Ensure that actual monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan and the approved methodology;
- (d) Evaluate the data recorded and stored as per the monitoring methodology.

The verification shall ensure that reported emission reductions are complete and accurate in order to be certified.

The verification team has based on the recommendations in the Validation and Verification Manual , and employed a risk-based approach, focusing on the identification of significant reporting risks.

1.3 Description of the Project Activity

Host Party	Republic of Korea
Project Title	Gochang Solarpark 14.98MW Photovoltaic Power Plant Project
Project Size	Small Scale
Applied Methodology(ies)	AMS-I.D. (ver.13)
UNFCCC Registration no.:	3009
Project Participant(s)	Gochang Solarpark Co.,Ltd.
Location of the Project	#100 Chiryong-Ri, Heungdeuk-Myeun, Gochang-Gun, Jeollabuk-Do GPS coordination: 35°32'21''N 126°42'40''E (35.5391°N 126.0711°E)
CDM Registration Date	01/03/2010
Crediting Period	01/03/2010 to 28/02/2020 (fixed)
Monitoring Period for this Verification	01/03/2010 to 31/05/2011

1.4 Verification Team

The verification team consists of 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>	<i>Technical Review</i>
Team Leader	Mr. SeungKeun Choi	✓	✓	✓	✓	
Team Member	Mr. Kyoo-II Sohn	✓	✓	✓	✓	
Team Member (Technical Expert)	Mr. Kyu-II Kim	✓	✓	✓		
Technical Reviewer	Mr. Seong-Yong Park					✓
Technical Reviewer (Technical Expert)	Mr. Chung-Kook Lee					✓

1.5. Internal Quality Control

After verification team prepared draft verification report, the person in charge of internal quality control process of KSA designated Mr. Seong-Yong Park and Mr. Chung-Kook Lee, who has been qualified by KSA's internal procedure, as a technical review team to review verification report and relevant documents prior to the submission of the report to the project participants and UNFCCC CDM secretariat. As a result of the review, verification report and statement has been revised.

2. METHODOLOGY

The verification of this project was carried out from Aug 2011 to May 2012 as follows:

- Preparations (Desk Review) : 04/08/2011 to 11/08/2011
- On-site assessment : 12/08/2011
- Request for revision of monitoring plan by another assessment process : approved on 30/04/2012
- Reporting: 01/05/2011 to 21/08/2012

The verification consisted of the following steps:

- A desk review of monitoring report /1-1/, the emission reduction spreadsheet /1-2/, and additional supporting documents (project design document /1-3/, the validation report /2-2/) which were provided by the project participant. KSA CDM Manual /2-6/ and CDM Validation and Verification Manual /2-1/ was used.
- On-site assessment.
- Follow-up action, background investigation and interview with the related personnel of the project participant.

To ensure a transparency, verification process was guided by the checklist.

2.1 Desk Review

The verification of the project documentation provided by the project participant is based upon both quantitative and qualitative information on emission reductions. Quantitative information comprises the reported numbers in the monitoring report version 01 dated 01/06/2011 submitted to the DOE.

Qualitative information comprises information on internal management controls, calculation procedures, procedures for transfer of data, frequency of emission reports and review and internal quality control. The monitoring report submitted by the project participant was also web hosted on the UNFCCC CDM website and this was available in the public domain.

The reviewed documents were as follows:

- The monitoring report /1-1/ (initial version 01 on 01/06/2011, final version 03 on 17/08/2012).
- The registered project design document /1-3/
- Applied monitoring methodology, AMS-I.D. (ver.13) /2-5/
- Revised Monitoring Plan /1-12/
- The validation report /2-2/
- The emission reduction Spreadsheet /1-2/
- Other supplementary documents listed in section 5. References below

2.2 On-Site Assessment

Verification team has carried out on-site assessment on 12/08/2011 and assessed followings:

- to verify the actual implementation and operation of the project as described in the PDD
- to check the instruments used for monitoring in the locations and the calibration records.
- to check the compliance of monitoring with the monitoring plan.
- to cross-check between information provided in the monitoring report and on-site records
- to verify the evidence for the reported emission reductions.
- to verify the QA/QC activity for the proposed project activity.
- etc.

During the site visit, the KSA verification team performed interviews with the project participants to confirm selected information and to resolve issues identified in the document review

2.3 Reporting Verification Findings

During verification process, Corrective Action Requests (CARs), Clarification Requests (CLs) and any other issues have been raised by verification team, and have been resolved with revision of monitoring report or additional information and/or evidences. Criteria for CARs, CLs and FARs are as follows and are based on the "Clean Development Mechanism Validation and Verification Manual (EB 55 Annex 1).

Corrective Action Request (CAR) is issued where one of following occurs;

- Non-conformities with the monitoring plan or methodology are found in monitoring and reporting, or if the evidence provided to prove conformity is insufficient.
- Mistakes have been made in applying assumptions, data or calculations of emission reductions that will impair the estimate of emission reductions;
- Issues identified in a FAR during validation or the previous verification to be verified during verification have not been resolved by the project participants.

Clarification (CL) is issued if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

A Forward Action Request (FAR) may be issued for action if the monitoring and reporting requires attention and/or adjustment for the next verification period.

To guarantee the transparency of the verification process, the concerns raised are documented in more detail in the verification protocol in the Appendix A. Table 2 Resolution of Corrective Action and Clarification Requests.

3. VERIFICATION FINDINGS

In the following sections the findings of the verification are stated. The findings from the desk review of the monitoring report and from interviews during the site visit are documented in more detail in the verification protocols given in Appendix A.

The Corrective Action Requests (CARs), the Clarifications (CLs) and Forward Action requests (FARs) are stated, where applicable, in the following section and are further documented in the Verification Protocol in the Appendix A. The verification of this project activity resulted in 2 CARs and 1 CL have been issued and successfully closed.

3.1 Remaining issues, CARs, FARs from Previous Validation or Verification

KSA verification team confirmed that all CARs and CLs raised during validation process were successfully closed. No issues including FARs are remaining.

3.2 Project Implementation in accordance with the registered PDD

Physical Components

The project activity is to generate electricity from renewable source by installing photovoltaic power plant with capacity of 14.98MW. Physical specifications of installed equipments verified by nameplates and manufacturer's information during on-site assessment are described belows:

Item	Type	Technology standards
Solar cells	Type	Sw-175/Sw-180
	Capacity	14,983.8kW
	Maximum output power	175w/180w
	Number of Module	175w: 57,120 / 180w: 27,710
	Efficiency	15%
Inverter	Type	Grid connected
	Rated voltage	DC 600v
	Output	500kW
	Control method	Current control (PWM)
	Node form	3-phase, 3-wire
	Number of units	30
	Efficiency	93%

As required by applicability condition by applied methodology AMS-I.D. (ver.13), verification team has confirmed that the electricity generated by the project is sold to KPX (Korea Power Exchange), with 'Confirmation of Installation for feed-in tariff facilities' /1-9/ and 'electricity sale receipts' /1-7/.

Through document review and on-site assessment, verification team has confirmed that the project has been implemented as described in the registered PDD.

Monitoring Equipments

The watt-hour meter for export electricity (KPX meter) with allowable error of $\pm 0.5\%$ is installed and managed based on the "Measures Act" in Korea /2-3/ and "Act on the operation of electricity market" /2-4/ and also sealed after affirmation of KPX (<http://www.kpx.or.kr>) (Korea Power Exchange). The power plant operator cannot open the security seal that protect the meter unless person of KPX is in the event. Revised monitoring plan stated that watt-hour meters would be calibrated every 3 year, even though host party's regulation requires 3.5 year frequency.

Watt-hour meter for electricity import is under KEPCO's control, complying with "Act on the operation of electricity market" /2-4/, and calibration frequency is 7 year in accordance with "Measures Act" /2-3/. However, in revised monitoring plan, the PP stated that the meter would be calibrated every 3 year.

Verification team has reviewed calibration records /1-15//1-16/ for all meters, and conducted on-site interview with the person in charge of monitoring. The watt-hour meters which are used at the site are summarized below:

Purpose	Serial No.	Accuracy Level	Previous Calibration	Calibration Status		Remarks
				Deadline	Actual	
Electricity Export	46026116	0.5S	04/06/2008	03/06/2011	21/07/2011	calibration deadline is after monitoring period
	46026119	0.5S	04/06/2008	03/06/2011	21/07/2011	
	46026124	0.5S	04/06/2008	03/06/2011	21/07/2011	
	46026128	0.5S	04/06/2008	03/06/2011	21/07/2011	
	51001427	0.5S	21/07/2009	20/07/2012	21/07/2011	OK
Electricity Import	0800406	1.0S	24/04/2008	23/04/2011	16/06/2010	OK
* 0.5S means maximum error does not exceed $\pm 0.5\%$ at full scale rating * 1.0S means maximum error does not exceed $\pm 1.0\%$ at full scale rating * Source: Meters Register /1-10/, managed by KPX Customer information /1-17/, provided by KEPCO Calibration Records /1-15//1-16/						

Implementation Timeline

Verification team reviewed "Inspection certificate prior to operation" /1-4/, issued by KESCO (Korea Electrical Safety Corporation), to confirm implementation timeline described in the monitoring report as follows:

Criteria	Date
Starting Date of Operation	Area #1 25/09/2008
	Area #2 27/09/2008
	Area #3 23/08/2008
	Area #4 31/05/2008
	Area #5 25/07/2008
Starting Date of Commissioning	31/05/2008
Completion of Construction	31/05/2008

Post-Registration Changes

During verification activity, verification team found followings that shows monitoring plan in the registered PDD is not consistently/completely described /CAR01/:

- (i) B.7.1 of the PDD shows that the PP declared the variable EG_y (net electricity generation) would be measured by reading watt-hour meter, which means a bi-directional meter would be installed. But, B.7.2 described that separate meters would be installed to measure import power. Furthermore, as per the worksheet attached to the monitoring report, the PP calculated the value EG_y , not measured as addressed in B.7.1 of the PDD.
- (ii) The PP stated in B.7.1 of the PDD that allowance margin of measurement error would be controlled within $\pm 0.5\%$. During on-site assessment, verification team identified accuracy of the import power meter was 1.0s, which has $\pm 1.0\%$ error.
- (iii) The PP addressed in the PDD that monitoring data would be kept for 2 years after crediting period on page 25, and for 2 + 20 (operational lifetime) years on page 26. verification team raised issue that this conflict information should be corrected.
- (iv) On page 25 in the registered PDD, the PP said that monitoring data will be measured hourly, and recorded monthly. At the same time, on page 26, paragraph 2-2, the PP mentioned that measured data shall be collected daily, weekly, and monthly and archived electronically. But, during on-site assessment, verification team found that measurement data have been archived daily by downloading from KPX website, not in accordance with prior descriptions.

In this reason, verification team could not proceed further verification activity, as paragraph 201 of VVM clearly requires, and concluded that the project was required to revise monitoring plan to

enhance consistency and accuracy of information and to ensure completeness of monitoring plan prior to proceeding remaining verification process.

Major changes on revised monitoring plan are listed below:

- (a) Information of monitoring equipments has been accurately revised;
- (b) Information related to accuracy level of each monitoring equipments has been corrected;
- (c) Data keeping period has been consistently corrected; and
- (d) Monitoring frequency and data flows have been consistently and accurately corrected.

Validation for revision of monitoring plan has been independently conducted by KSA, and the request for revision of monitoring plan has been approved by CDM EB on 30/04/2012.

3.3 Compliance of Monitoring Plan with the Monitoring Methodology

Verification team has found that the monitoring system of the project activity is complete and in accordance with the applied monitoring methodology AMS-I.D.(ver.13) /2-5/. The operating manual /1-5/ developed by the PP has appropriately reflected the content of the revised monitoring plan /1-12/. The monitoring methodologies and sustaining records are sufficient to enable verification of emission reductions.

Thus, KSA verification team confirm that the revised monitoring plan is in accordance with the approved monitoring methodology AMS-I.D.(ver.13) /2-5/ applied by project activity.

3.4 Compliance of Monitoring with the Monitoring Plan

According to the revised monitoring plan, the parameter which has to be monitored is net electricity supplied to the grid, "EG_y".

The parameters required by the monitoring plan:

EG_y * : Net electricity supplied to the grid by the project activity.

The amount of electricity supplied to the grid is continuously measured by a watt-hour meter, and monitored data are electronically archived in the electricity generation system. The measured data are not only downloaded by the person in charge of monitoring at the project site, but also electronically transferred to KPX database. The downloaded data can be compared with those of KPX's website (<http://www.kpx.or.kr>). Finally, KPX regularly issues 'electricity sale receipt' to confirm

the amount of electricity supplied to the grid by the project. So, the PP has records for electricity export - both (i) directly downloaded data from watt-hour meter and (ii) receipt issued by KPX.

The amount of electricity imported for auxiliary consumption from the grid is also continuously measured by a watt-hour meter, and monitored data are electronically archived in the KEPCO's system. Then, KEPCO also regularly issues bill - record for electricity import. The bills can also be reviewed at the KEPCO's website.

During the on-site assessment, KSA verification team reviewed Single Line Diagram /1-13/, checked actual location of meters, then confirmed that all monitoring equipments have been installed at the correct location in accordance with revised monitoring plan.

KSA verification team has also verified the data provided in the monitoring report against the relevant documented evidence such as the electricity sale receipts and bills, and found that they were consistent with the evidence.

According to the methodology AMS-I.D.(ver.13) /2-5/, there are no other external data required for determining the emission reduction of the project activity than the emission factor of the crediting period of the project activity has been determined ex-ante in the registered PDD.

The emission factor applied to baseline emission calculation is from the registered PDD, verified at validation stage.

3.5 Assessment of Data and Calculation of Greenhouse Gas Emission Reduction

Data Monitored

To calculate emission reductions, the PP has monitored (i) electricity export to the grid produced by the project activity and (ii) electricity import for auxiliary power consumption. Verification team has reviewed following records to confirm values in the monitoring report and excel worksheet are accurate:

- (a) Soft copy of daily measurement data for electricity production /1-6/
- (b) Electricity sale receipts issued by KPX (Korea Power Exchange) /1-7/
- (c) Bills for electricity import, issued by KEPCO /1-8/

Verification team has also compared (a) and (b) above to confirm data for electricity export, and found that two sets of data are not identical for six days. But, the difference is less than 1kWh, which does not impact on changes in emission reductions, the PP has applied lower value for

conservative approach, so verification team has concluded it is appropriate.

In conclusion, verification team has confirmed that following data used to calculate emission reductions are accurate, without any data not available:

Date (Month/Year)	Electricity Export (MWh)	Electricity Import (MWh)
Mar-10	1,495.419	14.189
Apr-10	2,205.638	13.814
May-10	2,424.300	16.085
Jun-10	2,242.535	18.926
Jul-10	1,912.883	25.740
Aug-10	1,812.848	32.429
Sep-10	1,728.143	20.059
Oct-10	1,623.217	12.629
Nov-10	1,347.462	11.014
Dec-10	910.555	12.418
Jan-11	1,227.939	14.851
Feb-11	1,398.675	11.815
Mar-11	2,453.545	12.362
Apr-11	2,475.037	11.340
May-11	2,326.670	14.496
Total	27,584.867	242.167
Net electricity supplied to the grid = 27,584.867 - 242.167 = 27,342.699 MWh		

Calculating Emission Reductions

To calculate emission reductions, monitoring report has applied following formula described in the registered PDD.

$$\text{Emission Reduction} = \text{Baseline Emission} - \text{Project Emission} - \text{Leakage Emission}$$

Based on the registered PDD, project emission and leakage emission are regarded to zero, while formula to calculate baseline emission is defined as below:

$$\text{Baseline Emission} = \text{Net electricity supplied to the grid} \times \text{Emission factor}$$

where, Emission factor has been fixed as 0.6096 tCO₂/MWh and;

Net electricity supplied to the grid is 27,342.699 MWh for this monitoring period.

$$\begin{aligned}\text{So, BE} &= 27,342.699 \text{ MWh} \times 0.6096 \text{ tCO}_2/\text{MWh} \\ &\approx 16,668 \text{ tCO}_2\end{aligned}$$

Compare to the ex ante estimation of emission reductions - 13,523 tCO₂/yr, actual emission reduction of 16,668 tCO₂ is higher. Considering monitoring period is from 01/03/2010 to 31/05/2011, 1 year and three month, ex ante estimation shall be modified to 16,903 tCO₂/yr, which is almost same to actual reduction.

3.6 Management System and Quality Assurance

As required by VVM (ver 01.2) paragraph 205 (b) (iv) and 205 (c) (ii), verification team has carried out assessment for implementation status of both management/operational system and QA/QC procedure, described in the revised monitoring plan.

Monitoring Equipment

All monitoring equipments have been appropriately installed in accordance with procedure described in the revised monitoring plan. Calibration for equipments has been carried out as described in section 3.2 above.

Amount of Electricity Monitoring

Actual operation for monitoring frequency, data flows and recording method was in accordance with description of revised monitoring plan. Difference between two sources of monitoring data has been identified during monitoring period, and conservative approach defined in 2-3 of QA/QC procedure in the revised monitoring plan has been appropriately applied.

Manager of Monitoring and Electricity Safety

Organization structure with roles and responsibilities has been identified during on-site assessment. Competence requirements for monitoring personnel demonstrated in the revised monitoring plan has been appropriately ensured.

As a result of assessment for above criteria, verification team has concluded that management, operation, quality control and assurance system defined in the revised monitoring plan has been appropriately applied .

4. PROJECT SCORECARD

Risk Areas		Conclusions			Summary of findings and comments
		Baseline Emissions	Project Emission	Calculated Emission Reductions	
Completeness	■ Source coverage/ boundary definition	OK	OK	OK	During on-site assessment, verification team has confirmed that all emission sources related to the project activity is considered, in accordance with applied methodology AMS-I.D.(ver.13) /2-5/.
Accuracy	■ Physical Measurement and Analysis	CAR01	N/A	OK	Physical features of project implementation is consistent with registered PDD /1-3/, but monitoring plan, especially for measuring equipments and frequency is not consistently described in the registered PDD. In this reason, verification team requested the PP to revise monitoring plan /1-12/ to ensure completeness and accuracy of information. The revision has been approved by EB on 30/04/2012
	■ Data calculations	OK	N/A	OK	Calculation formula and parameters are appropriately applied in accordance with registered PDD.
	■ Data management & reporting	CAR01	N/A	OK	Recording and archiving frequency described in the registered PDD was not consistently described with actual implementation status. Revised monitoring plan approved by EB ensure accuracy of information related to data management and reporting procedure.
Consistency	■ Changes in the project	OK	N/A	OK	There has been no change of the project activity.

5. REFERENCES

Category 1 Documents:

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

- /1-1/ Monitoring report (initial version date on 01/06/2011, final version dated on 17/08/2012)
- /1-2/ Emission reduction spreadsheet (version 01)
- /1-3/ Registered PDD (version 07, 04/01/2011)
- /1-4/ Inspection certificates prior to operation, issued by KESCO (Korea Electrical Safety Corporation), on 31/05/2008, 28/07/2008, 23/08/2008, 25/09/2008, and 27/09/2008, for each of five area),
- /1-5/ Operating Manual (rev.0, April 2010)
- /1-6/ Soft copy of daily measurement data for electricity production - source of the copy is the measurement data recorded in the watt-hour meter.
- /1-7/ Electricity sale receipts issued by KPX
- /1-8/ Bills for electricity import, monthly issued by KEPCO
- /1-9/ Confirmation of Installation for feed-in tariff facilities issued by KEMCO
- /1-10/ Meters register issued by KPX (initially prepared on 09/06/2008, with continuous update)
- /1-11/ Training records (issued on 04/08/2010)
- /1-12/ Revised Monitoring Plan (approved on 30/04/2012)
- /1-13/ Single Line Diagram for Gochang Solarpark (rev.0, document no. E1-01)
- /1-14/ Electric Utility Act (rev. 01/01/2012)
- /1-15/ Calibration Records for export watt-hour meters, issued by KPX
- /1-16/ Calibration Records for import watt-hour meter, issued by KEPCO
- /1-17/ Customer information, KEPCO's internal record

Category 2 Documents:

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

- /2-1/ Validation and Verification Manual (EB55)
- /2-2/ Validation Report (version 04, 01/05/2010)
- /2-3/ Measures Act
- /2-4/ Act on the operation of electricity market
- /2-5/ AMS-I.D.(ver.13)
- /2-6/ KSA CDM Manual

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

Interview on 12/08/2011

Name	Organization	Position
Sung-Wook Jang	Gochang Solarpark Co.,Ltd.	Manager
Byung-Hee Choi	Gochang Solarpark Co.,Ltd.	Manager
Yoon-Mi Kim	Ecoeye Co.,Ltd.	Consulting Firm
Da-Jung Jung	Ecoeye Co.,Ltd.	Consulting Firm

APPENDIX A

VERIFICATION PROTOCOL FOR SMALL-SCALE CDM ACTIVITIES

Table 1 Verification Requirements Checklist based on the VVM (Version 01.2, EB55 Annex1)

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
0.1 Remaining Issues. /VVM 182/					
0-1 Have all issues identified in a FAR during validation to be verified during verification been resolved by the project participants ?	VVM 190 (c)	DR	OK. Verification team reviewed final validation report written by KEMCO (Korea Energy Management Corporation), and found that there was no FAR issued during validation process.	OK	OK
0.2 The Monitoring Report Form /EB54 Annex 34/					
0.2-2 Is the Monitoring Report Form in accordance with the latest template and guidance by the CDM EB.	EB 54 Annex 34	DR	OK. The PP has used most recent form of monitoring report based on VVM schem, available on UNFCCC website.	OK	OK
1. Project Implementation in accordance with the registered project design document.					
It shall be identified any concern related to the conformity of the actual project activity and its operation with the registered project design document. /VVM 195/					
1.1 Are all physical features of the proposed CDM project activity proposed in the registered PDD in place?	VVM 196	OSV	<p>OK. Verification team has conducted on-site assessment to confirm that physical aspect of project implementation is in accordance with registered PDD. All facilities including modules and inverters have been exactly installed.</p> <ul style="list-style-type: none"> - module: 14.98MW (175w x 57,120EA / 180w x 27,710EA) - inverter: 500kw x 30ea <p>Verification team reviewed following evidences to confirm that installed capacity of the project activity is 14.98MW as described in the registered PDD, except starting date of operation in the monitoring report is different from following documents /CAR02/:</p> <ul style="list-style-type: none"> - Inspection certificate prior to operation, issued by KESCO (Korea Electrical Safety Corporation) /1-4/ - Confirmation of Installation for feed-in tariff facilities, issued by new & renewable energy center of KEMCO /1-9/ - Meters register /1-10/, managed by KPX (Korea Power Exchange) 	CAR-02	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
1.2 Has the project participants operated the proposed CDM project activity as per the registered PDD?	VVM 196	OSV	<p>Verification team found that monitoring plan described in the registered PDD is not consistent. In this reason, verification team could not proceed verification process, and raised issue to revise monitoring plan , in consistent manner, reflecting actual status of project implementation /CAR01/.</p> <p>After revised monitoring plan /1-12/ has been approved by CDM EB, verification team proceed further verification activity, and confirmed that actual operational status is in accordance with revised monitoring plan.</p>	CAR01	OK
1.3 Is an on-site visit conducted?	VVM 196	OSV	OK. Verification has conducted on-site assessment on 12/08/2011	OK	OK
▪ If not, is it justified the rationale of the decision.	VVM 196	OSV	N/A. On-site assessment has been conducted.	OK	OK
1.4 Is it identified that the implementation or operation of CDM project activity does not conform with the description contained in the registered PDD ? If yes, following actions are conducted.	VVM 197	OSV	Issue had been raised, and has been resolved. Refer to 1.2 above.	CAR-01	OK
a) Has an assessment been conducted on the potential impacts due to these changes following the relevant guidelines established by the EB ? (EB 48 report, paragraph 73 and its annex 67)	VVM 197	OSV/ DR	Issue had been raised, and has been resolved. Refer to 1.2 above.	CAR-01	OK
b) Has a notification or a request for approval of changes been submitted from the project activity as described in the registered PDD prior to the conclusion of the verification/certification for the corresponding monitoring period based on above assessment.	VVM 197	OSV/ DR	Issue had been raised, and has been resolved. Refer to 1.2 above.	CAR-01	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
2. Compliance of the monitoring plan with the monitoring methodology.					
<i>It is assessed whether the monitoring plan of the proposed CDM project activity comply with the applied methodology. /VVM 199/</i>					
2.1 Is it the validated monitoring plan in accordance with the approved methodology applied by the proposed CDM project activity?	VVM 200	DR	Applied methodology AMS-I.D.(ver.13) requires to monitor electricity generation by meters. The monitoring plan describes that electricity generation would be measured by watt hour meter. So, verification team concluded the monitoring plan in the registered PDD is in accordance with applied methodology. Verification team has reviewed revised monitoring plan, and also concluded it is in lined with AMS-I.D.(ver.13).	OK	OK
2.2 If the monitoring plan is no accordance with the monitoring methodology, are a request for revision of the monitoring plan for approval by the CDM EB done? (EB 33 Report 84)	VVM 201	DR	N/A	OK	OK
2.3 Are there any monitoring aspects of the project activity that are not specified in the methodology, particularly in the case of small scale methodologies (e.g. additional monitoring parameters, monitoring frequency and calibration frequency)?	VVM 202	DR	Applied monitoring methodology AMS-I.D.(ver.13) requires only measure electricity by meters, without concerning auxiliary power consumption supplied from the grid. But, the PP has reflected it into monitoring report by cutting off the value of electricity production by auxiliary power consumption.	OK	OK
▪ If yes, is it brought to the attention of the CDM EB issues which may contribute in enhancing the level of accuracy and completeness of the monitoring plan.	VVM 202	DR	It is already reflected into recent version of AMS-I.D.	OK	OK
3. Compliance of the monitoring with the monitoring plan					
<i>It is assessed whether monitoring of reductions in GHG emissions to result from the proposed CDM project activity shall be implemented in accordance with the monitoring plan contained in the registrated PDD or accepted revised monitoring plan. /VVM 204/</i>					

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
3.1 Have monitoring plan and the applied methodology been properly implemented and followed by the project participants ?	VVM 205 (a)	DR OSV	During on-site assessment, verification team found that monitoring plan in the registered PDD is not consistently described, so the team was not able to assess confirmity of implementation /CAR01/. In this reason, verification team requested the PP to revise monitoring plan to reflect actual operational status. After revised monitoring plan is approved by EB, verification team has concluded that project has been implemented in accordance with revised monitoring plan.	CAR-01	OK
▪ If not, is a request for revision of the monitoring plan done ? - EB49, Annex 4 (Procedures), Annex 27 (Form)	VVM 212	DR	Yes, the PP requested for revision of monitoring plan with KSA's validation opinion, and EB has approved it.	OK	OK
3.2 Have all parameters stated in the monitoring plan, the applied methodology and relevant CDM EB decisions been sufficiently monitored and updated as applicable, including ;	VVM 205 (b)	DR OSV	OK. See below.		
▪ Project emission parameters ?	VVM 205 (b) (i)	DR	There is no project emission for the project activity in accordance with applied methodology AMS-I.D.(ver.13).	OK	OK
▪ Baseline emission parameters ?	VVM 205 (b) (ii)	DR OSV	OK. To calculate baseline emission, following equation was applied: BE = Net electricity generation x Emission factor The PP has independently monitored electricity export and import, and net electricity generation could be calculated by difference between export and import : Net electricity generation = 27,584.867MWh - 242.167MWh = 27,342.699MWh	OK	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
			Emission factor is fixed as 0.6096 tCO ₂ /MWh In this manner, 16,668 tCO ₂ of baseline emission was appropriately calculated.		
▪ Leakage parameters ?	VVM 205 (b) (iii)	DR	There is no leakage emission for the project activity in accordance with applied methodology AMS-I.D.(ver.13).	OK	OK
▪ Management and operation system; the responsibility and authorities for monitoring and reporting are in accordance with the responsibilities and authorities stated in the monitoring plan ?	VVM 205 (b) (iv)	DR OSV	OK. Verification team has reviewed operating manual /1-5/, and found that it is in accordance with monitoring plan in the PDD. The manual defines roles, responsibilities and work process to operate the project activity. In this reason, verification team confirmed that management and operation system is appropriate.	OK	OK
3.3 Is the accuracy of equipment used for monitoring in accordance with the relevant guidance provided by the CDM EB and controlled and calibrated in accordance with the monitoring plan ?	VVM 205 (c)	OSV	OK. Verification team checked installed watt-hour meters for export electricity on site, reviewed 'Meters Register' /1-10/, and confirmed that all monitoring equipments are in accordance with registered PDD. Calibration deadline was after the monitoring period under the verification. For watt-hour meter for import electricity, verification team reviewed customer information provided by KEPCO, and the document shows calibration information for the meter. Additional interview has been carried out to confirm it.	OK	OK
▪ Are monitoring results consistently recorded as per approved frequency ?	VVM 205 (c) (i)	OSV	Monitoring and recording frequency are not consistently described in the registered PDD, so verification team has raised issue to enhance accuracy of information /CAR01/. The PP has requested for revision of monitoring plan reflecting actual operational situation, and EB has approved it. Verification team confirmed that revised monitoring plan is in lined with actual status.	CAR-01	OK
▪ Have QA/QC been applied in accordance with the	VVM 205	OSV	OK. The PP has developed operating manual for the project, verification team reviewed it and then found that it has quality	OK	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
monitoring plan ?	(c) (ii)		control and assurance procedure including emergency plan and resource management plan. To ensure competence of person in charge of monitoring, the operating manual requires to train regularly. Verification team has reviewed relevant training record /1-11/. and confirmed that appropriate education has been carried out.		
4. Assessment of data and calculation of the greenhouse gas emission reductions.					
It is assessed whether GHG emission reduction achieved by / resulting from the proposed CDM project activity are calculated applying the selected methodology. /VVM 207/					
4.1 Is a complete set of data for the specified monitoring period is available?	VVM 208 (a)	DR OSV	OK. Verification team reviewed electricity export data recorded into local computer system. For auxiliary power consumption (electricity import), bills issued by supplier (KEPCO) were provided and reviewed by verification team.	OK	OK
▪ If only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, is it either the most conservative assumption theoretically possible in finalizing the verification report, or raise a request for deviation prior to submitting request for issuance if appropriate.	VVM 208 (a)	DR OSV	N/A	OK	OK
4.2 Has information provided in the monitoring report been cross checked with other sources such as plant log books, inventories, purchase records, laboratory analysis?	VVM 208 (b)	DR OSV	OK. Electricity export has been downloaded into local computer, and could also be checked by sales receipt /1-7/ issued by KPX (Korea Power Exchange). Verification team confirmed that both local data and sale receipt have same value except following: - Electricity production data were slightly different for six days: 26/03/2010, 09/08/2010, 11~13/08/2010, and 16/08/2010. - The PP applied lower value for conservative approach, and verification team accepted it. Also refer to the section 3.5 in the report.	OK	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl.	Final Concl.
4.3 Have calculations of baseline emissions, proposed CDM project activity emissions and leakage, as appropriate, been carried out in accordance with the formulae and methods described in the monitoring plan and the applied methodology document?	VVM 208 (c)	DR OSV	<p>OK. Baseline emission was calculated with formula defined in the registered PDD as follows:</p> $\begin{aligned} \text{BE} &= \text{EG} \times \text{EF} \\ &= 27,342.699\text{MWh} \times 0.6096 \text{ tCO}_2/\text{MWh} \\ &= 16,668 \text{ tCO}_2 \end{aligned}$ <p>Project emission and Leakage emission are not considered in the registered PDD.</p>	OK	OK
4.4 Have any assumptions used in emission calculations been justified?	VVM 208 (d)	DR	N/A. There was no assumption made in the PDD.	OK	OK
4.5 Have appropriate emission factors, IPCC default values and other reference values been correctly applied?	VVM 208 (e)	DR	OK. Emission factor was fixed-value.	OK	OK

Table 2 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	<p>Monitoring plan in the registered PDD is not consistently described. Therefore, verification team cannot assess whether implementation of monitoring plan is complied with the registered PDD:</p> <ul style="list-style-type: none"> -PDD B.7.1 shows that the PP declared the variable EG_y would be measured, by reading watt-hour meter. This means bi-directional meters would be installed, but, B.7.2 described that separate meters would be installed to measure import power. Furthermore, as per the worksheet attached to the monitoring report, the PP calculated the value EG_y, not measured as addressed on B.7.1. -The PP stated on the PDD that allowance margin of measurement error would be controlled within 0.5% (B.7.1). During on-site assessment, verification identified accuracy of the import power meter was 2.0s, which means 2.0% uncertainty. - The PP addressed in the PDD that monitoring data would be kept for 2 years after crediting period on page 25, and for 2 + 20 (operational 	VVM paragraph 184(a)(ii), 195,197	<p>To resolve inconsistency of monitoring plan in the registered PDD, monitoring plan has been revised and approved by EB on April 30, 2012. All the issues raised by DOE have been corrected with consistent manner.</p> <p>All the issues raised in CAR01 is reflected in the section B.7.1 and B.7.2 of the revised monitoring plan</p>	<p>Accepted.</p> <p>Verification team confirmed that revised monitoring plan approved by EB consistently describes monitoring system (eg, measuring equipment and frequency, recording frequency, etc) compare to the actual implementation status.</p>

No. of CAR/CL	Description of the CAR/CL	Ref.	Comments/Response from project proponent	Conclusions
	lifetime) years on page 26. - On page 25 in the registered PDD, the PP said that monitoring data will be measured hourly, and recorded monthly. At the same time, on page 26, paragraph 2-2, the PP mentioned that measured data shall be collected daily, weekly, and monthly and archived electronically.			
CAR 02	relevant dates for the project activity addressed in the MR is not accurate.	MR A.1	All dates in the monitoring report have been reviewed and modified. It is reflected in section A.1 of the revised monitoring report	Accepted. Verification team confirmed that all data listed in the MR is accurately modified.
CL 01	MR has some information different from the registered PDD: -MR says that the project activity utilizes renewable wind power	MR A.4 E.3	Mistyped information in the initial monitoring report have been reviewed and modified. It is reflected in the revised monitoring report	Accepted. All mis-stated information is correctly modified in the revised monitoring report

APPENDIX B

CERTIFICATE OF COMPETENCE

KSA

CDM Validator/Verifier Certificate

Seung-Keun Choi

Certificate No. : CDM-015

Technical Area : -

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.

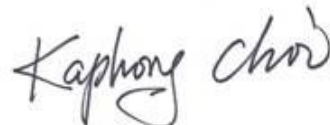
VALID FROM

2011.01.21

VALID UNTIL

2014.01.20

PRESIDENT OF KSA



KOREAN STANDARDS ASSOCIATION

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



GHG Validator/Verifier Certificate

Kyoo-Il Sohn

Certificate No. : CDM-001

Technical Area : 13.1

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

2011.1.21

VALID UNTIL

2014.1.20

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



Technical Expert Certificate

Kyu-Il Kim

Certificate No. : CDM-018

Technical Area : 1.2, 2.1, 2.2, 3.1

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.

VALID FROM

2010.09.20

VALID UNTIL

2013.09.19

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 Validator/Verifier Certificate

Seong-Yong Park

Certificate No. : CDM-014

Technical Area : -

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.

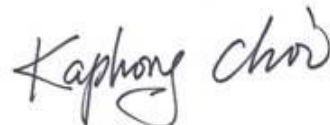
VALID FROM

2011.01.21

VALID UNTIL

2014.01.20

PRESIDENT OF KSA



KOREAN STANDARDS ASSOCIATION

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



Technical Expert Certificate

Chung-kook Lee

Certificate No. : CDM-013

Technical Area : 1.2, 2.1, 2.2, 3.1

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.

VALID FROM

2010.09.20

VALID UNTIL

2013.09.19

PRESIDENT OF KSA

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

KOREAN STANDARDS ASSOCIATION

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