

MONITORING REPORT FORM (CDM-MR) *
Version 01 - in effect as of: DD/MM/YYYY

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* as contained within the document entitled "Guidelines for completing the monitoring report form (CDM-MR)" (EB 54 meeting report, annex 34).

MONITORING REPORT
Version 03 and date 17/08/2012
Title: GOCHANG SOLARPARK 14.98MW PHOTOVOLTAIC POWER PLANT PROJECT
UNFCCC Reference Number: 3009
Monitoring period: 01/03/2010 – 31/05/2011

SECTION A. General description of the project activity

A.1. Brief description of the project activity:

- Purpose of the project activity and Measures taken to reduce greenhouse gas emissions

The project activity is a unilateral CDM project with 14.98MW of total capacity which generates electricity via the use of solar energy and delivers the generated electricity to the grid.

Since PV power plant technology can generate electricity without emitting any greenhouse gas (GHG), this project activity contributes to the reduction of GHG by alternating at least one of fossil fuel-fired power plants which would have generated electricity with emitting GHG.

-Brief description of the installed technology and equipments

This project is operated and maintained by Gochang solarpark Co., Ltd. The project site is divided into 5 areas and the total capacity of PV power plant is about 15MW.

	Item	Gochang	
I	Module Maximum Output Power	175W	9,996,000W
	Number of module	57,120 piece	
II	Module Maximum Output Power	180W	4,987,800W
	Number of module	27,710 piece	
Total			14,983,800W

- Relevant dates for the project activity

Item	Gochang
Completion of construction	31/05/2008
Commissioning date	31/05/2008 (Area#4)
Starting date of operation	31/05/2008 (Area#4)
	25/07/2008 (Area#5)
	23/08/2008 (Area#3)
	25/09/2008 (Area#1)
	27/09/2008 (Area#2)
The 1st monitoring period	01/03/2010 ~ 31/05/2011

- Total emission reductions achieved in this monitoring period:

From 01/03/2010 to 31/05/2011, the net power supplied to the grid by the project is 27,342.70MWh, corresponds to the emission reductions of 16,668.11 tCO₂e.

A.2. Project Participants

<Project participants>

Name of Party	Private entity	Kindly indicate if the party involved wishes
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involved		to be considered as project participant
Republic of Korea(host)	Private entity: Gochang Solarpark Co., Ltd.	No

A.3. Location of the project activity:

The project site is located in #100, Chiryong-Ri, Heungdeuk-Myeun, Gochang-Gun, Jeollabuk-Do, in the southwestern part of Korea. The site's approximate coordinates are east longitude of 35°32'21'' and north latitude of 126°42'40''.

A.4. Technical description of the project

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The purpose of the project is to build a photovoltaic power plant with an installed capacity of 14.98 MW. Regarding the technology/measure of the project, Solarworld Co.Ltd's solar cells were chosen and utilized for the proposed project and a total of 175W*57,120, 180W*27,710 pieces of module supplied 16.9% efficiency.

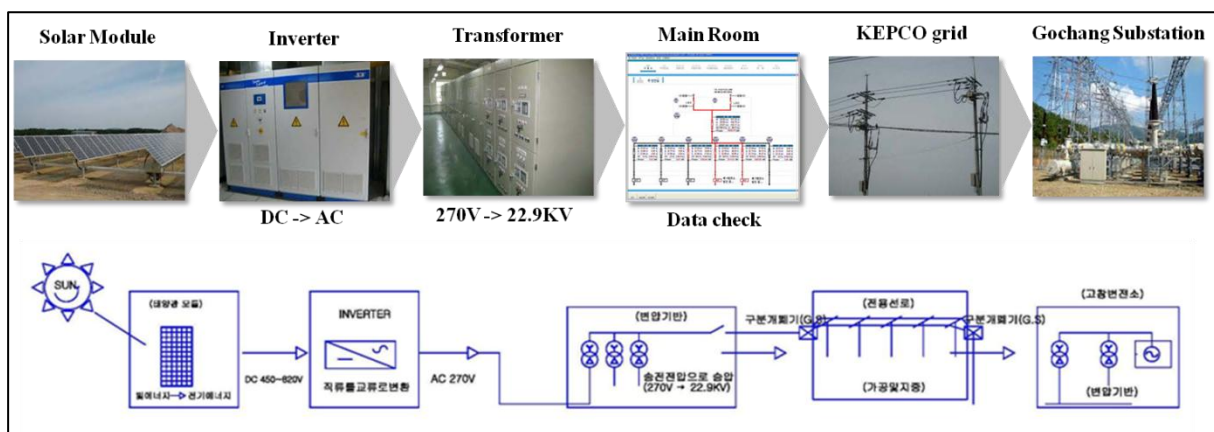
The 5 areas of the solar cell module are connected to junction boxes and linked to an inverter, and the fuses are installed in series so the string can be conducted for the series. This allows for prompt action to be taken in the event the solar cell module malfunctions.. A three-phase observation with current control to observe the important parameters such as voltage and frequency of the grid has been installed.

Also for unmanned operation of the plant, each facility is able to be controlled and supervised in the same way from the on-site main control room, switchboard of the electrical management department and electric control center in the power plant area.

In the communication board of the inverter, it is possible to audit and measure the data by sending electric information such as power generation, voltage, electric current and frequency of photovoltaic generation of electric power to the main computer. It is also possible to audit and measure the data remotely via a LAN(Local Area Network) or modem, and in the event that there is a system malfunction, it can be caught and dealt with quickly from a remote location.

The efficiency of a solar PV plant depends on isolations and other seasonal effect. The standard utilization rate of the proposed project is 16.9% and the output is about 22,183MWh/year. The generated electricity from the plant is connected to KEPCO (: Korea Electric Power Corporation.) electric poles located near the project site.

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%



<Gochang Solar Park PV Generating Plants Grid Interconnection Diagram>

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

The baseline and monitoring methodology applied to the project activity referred to small-scale project category of Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

Methodologies Used: AMS-I.D. (ver. 13) – Grid connected renewable electricity generation

A.6. Registration date of the project activity:

Registration Date: 01 Mar 10

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

Starting date of the first crediting period: 01/03/2010

Length of the total crediting period: 10 years (01/03/2010 ~ 28/02/2020)

A.8. Name of responsible person(s)/entity(ies):

Lee, Hun(team head-Korea Infrastructure Investment Asset Management Co.,Ltd)
E-mail.: hlee@kinfra.co.kr
Tel: 82-2-6333-3523

SECTION B. Implementation of the project activity

B.1. Implementation status of the project activity

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1. Relevant dates of project activity:

Item	Gochang
Completion of construction	31/05/2008
Commissioning date	31/05/2008 (Area#4)
Starting date of operation	31/05/2008 (Area#4)
	25/07/2008 (Area#5)
	23/08/2008 (Area#3)
	25/09/2008 (Area#1)
	27/09/2008 (Area#2)

2. The information regarding the actual operation:

Item	Area	Information
Overhaul		N/A
Downtimes	#1	7 times (Exchange of IGBT stack, IGBT DC clamp, Grid Voltage measurement switch)
	#2	1 time (Exchange of SMU Hub)
	#3	3 times (Exchange of IGBT stack, power supply)
	#4	6 times (Exchange of countercurrent observation relay, Exchange of R-IOS Bender, Exchange of DC clamp, Exchange of power supply)
	#5	5 times (Exchange of SMU Hub, Exchange of DC clamp, Exchange of countercurrent observation relay)
Exchange of equipment		N/A

3. Events or situations which may impact on the applicability of the methodology:

There were no events may impact on the applicability of methodology such as increases or decreases in capacity of facilities.

B.2. Revision of the monitoring plan

Not applicable

B.3. Request for deviation applied to this monitoring period

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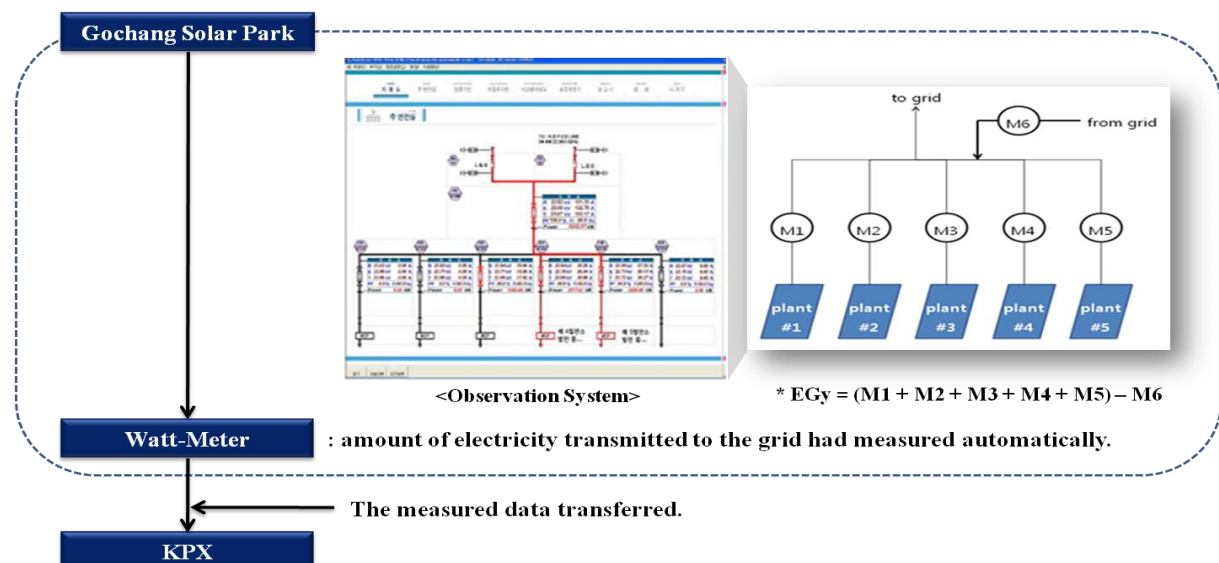
Not applicable

B.4. Notification or request of approval of changes

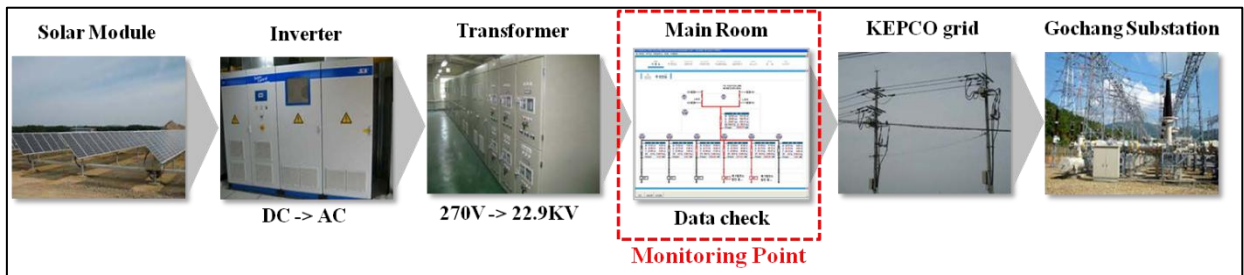
Not applicable

SECTION C. Description of the monitoring system

1. Description of the monitoring system



2. Monitoring Point for the project:



Monitoring Points are located onsite main room. Electricity monitored by watt-hour meter with accuracy range $\pm 0.5\%$ is delivered to the grid. Watt-hour meters with $\pm 0.5\%$ error will be installed for electricity export, and $\pm 1.0\%$ for import.

3. Operational and management structure:

Gochang Solarpark Co.,Ltd has two teams related to the project activity. One is an operating team, the other is a maintenance & management team, shown as following diagram.



- Gochang Solar Park (Seoul Office)

The Head office (Seoul) Gochang Solar Park manages the overall monitoring procedure for the management of emissions reduction.

Seoul office is responsible for collecting the monitoring result and monitoring report management and approvals.

- Operating Team and Maintenance & Management Team (Gochang Site Office)

Gochang site office of Gochang Solar Park is responsible for the monitoring of the CDM project and provided the monitoring result regularly to the Head Office.

Operating Team and Maintenance & Management Team manage tasks regarding calibration/maintenance of the meters, system management and select a person in charge of the monitoring installation management. Also the General Manager should arrange roles for the person in charge of the monitoring installation management.

Maintenance & Management Team is responsible for collecting and documentation of the net electricity data supplied to the grid, and check and review the collected monitoring data(net electricity).

4. Quality control (QC) and quality assurance (QA) procedures

1) Monitoring equipment

1-1) Electricity measuring meters shall be set up transparently in accordance with “Measures act” and “Act on operation of the electricity market” and shall be sealed after receiving the affirmation of Korea Power Exchange.

1-2) Calibration shall be performed at the first installation, and re-calibration shall be done at least once in three years for the meter in accordance with the General guideline to SSC CDM methodologies.

2) The amount of electricity monitoring

2-1) Gochang solarpark’s watt-hour meters continuously monitor electricity power production, record the amount every five minutes, and the data collected by watt-hour meter is transferred to KPX at 24:00 in order that KPX publishes the data to have been transferred on their homepage every day.

2-2) Meanwhile, The person in charge of monitoring shall download recorded data from watt-hour meters on-site every day, and make comparison with data to have been published on homepage of KPX.

2-3) If the data are not identical, the problem shall be solved by immediate action of contacting KPX for seeking causes. If the data are not identical after the confirmation, a conservative value will be utilized to calculate reduction amount.

3) Course of the person in charge of monitoring

3-1) The person in charge of monitoring shall attend the following courses once in three years. In case of replacement of a person in charge, related education shall be done in order not to cause problems on data collecting and QA/QC.

- Course on Electricity safety.

3-2) The person in charge of monitoring is regularly educated once a year with company's internal contents below:

- Course on ‘Measures Act’

- Course on ‘Act on operation of electricity market’

3-3) In the event that the responsible person is absent, a second responsible person shall be selected.

3-4) If the responsibility for monitoring and electricity safety is transferred to another person, it must first be approved by the final decision-maker.

3-5) Data will be kept for two years after the last issuance of CERs for this project activity.

5. Emergency procedure

In the event that the responsible person is absent, a second responsible person shall be selected. If the responsibility for monitoring and electricity safety is transferred to another person, it must first be approved by the final decision-maker.

SECTION D. Data and parameters

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors

Data / Parameter:	EFy
Data unit:	tCO ₂ /MWh
Description:	The combined margin emission factor in the Republic of Korea grid
Source of data used:	The registered PDD
Value(s) :	0.6096 tCO ₂ /MWh
Indicate what the data are used for (Baseline/ Project/ Leakage emission)	The data (EFy) is used for baseline emission calculation.

calculations)	
Additional comment:	This parameter was calculated ex-ante as 0.6096tCO _{2e} /MWh in the registered PDD and will be fixed during the first crediting period.

D.2. Data and parameters monitored

Data / Parameter:	Electricity Quantity, EG _y																
Data unit:	MWh																
Description:	Net electricity supplied to the grid by renewable technology in the year y																
Measured /Calculated /Default:	Directly measured and calculated.																
Source of data:	<ul style="list-style-type: none"> Exported data: Measured by the watt-hour meter.(Double checked by receipt of sales from the KPX.) Imported data: Collected by the bill issued by KEPCO(Korea Electricity Power Corporation). 																
Value(s) of monitored parameter:	Total values in this monitoring period: 27,342.70MWh For the detail value in the monitoring period, refer to the ER spreadsheet.																
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for Baseline emission calculations.																
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	<p>Measuring: Watt-hour meter</p> <p>- Exported Watt-hour meter</p> <p>1.Type: AC3P4W</p> <p>2. Accuracy: 0.5S.</p> <p>3. Serial number:</p> <table border="1"> <thead> <tr> <th></th><th>Serial Number</th></tr> </thead> <tbody> <tr> <td>#1</td><td>46026116</td></tr> <tr> <td>#2</td><td>46026119</td></tr> <tr> <td>#3</td><td>46026124</td></tr> <tr> <td>#4</td><td>51001427</td></tr> <tr> <td>#5</td><td>46026128</td></tr> </tbody> </table> <p>4. Calibration frequency : within 3 years</p> <p>5. Date of last calibration: 04/06/2008(#1,#2,#3,#5) 21/07/2009(#4)</p> <p>6. Validity period: 04/06/2008 - 03/06/2011(#1,#2,#3,#5) 21/07/2009 – 20/07/2012(#4)</p> <p>- Imported Watt-hour meter</p> <p>1.Type: AC3P4W</p> <p>2. Accuracy: 1.0S.</p> <p>3. Serial number:</p> <table border="1"> <thead> <tr> <th></th><th>Serial Number</th></tr> </thead> <tbody> <tr> <td>Imported electricity</td><td>0800406</td></tr> </tbody> </table> <p>4. Calibration frequency : within 3 years</p> <p>5. Date of initial calibration: 24/04/2008</p> <p>6. Date of last calibration: 16/06/2010</p>		Serial Number	#1	46026116	#2	46026119	#3	46026124	#4	51001427	#5	46026128		Serial Number	Imported electricity	0800406
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Imported electricity	0800406																

	7. Validity period: 16/06/2010 ~ 15/06/2013
Measuring/ Reading/ Recording frequency:	All electricity measuring meters are watt-hour meter type and the meters consists of five watt-hour meter to grid and one watt-hour meter from grid. - Exported electricity means only electricity quantity supplied to the grid. The export electricity continuously monitored and every five minutes recorded. - Import electricity means only auxiliary consumption supplied from the grid. Import electricity checked by KEPCO'S bill once a month.
Calculation method (if applicable):	The net(Export – Import) electricity would be calculated based on Export & Import data. * $EG_y = \text{Export electricity} - \text{Import electricity}$
QA/QC procedures applied:	- QA/QC procedure is prepared - Watt-hour meters with $\pm 0.5\%$ error installed for electricity export, and $\pm 1.0\%$ for import. - According to SSC CDM, meter (import, export) will be re-calibrated within 3 years.

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

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Follow the registered PDD in accordance with AMS-ID (version 13), the Baseline emissions (BE_y) during the monitoring period is calculated as follows:

$$BE_y = EG_y * EF_y$$

Where;

BE_y: Baseline Emissions (tCO₂e)

EG_y: Net electricity amount supplied to the grid by the project. (MWh)

EF_y: Baseline emission factor (tCO₂e/MWh)

1) Net electricity supplied to the grid by the project

Periods	Electricity		
	EG out	EI in	Net
01/03/2010 - 31/12/2010	17,702.999	177.303	17,525.697
01/01/2011 - 31/05/2011	9,881.867	64.864	9,817.003
Total	27,584.867	242.167	27,342.699

2) EF_y – Emission Factor of grid. (tCO₂e/MWh)

The Baseline Emission Factor is calculated ex-ante 0.6096 tCO₂e/MWh in the registered PDD and will be fixed during the first crediting period.

3) Baseline Emission (BE_y)

The baseline emission BE_y (tCO₂e) during this monitoring period is calculated as followings;

$$BE_y = EG_y * EF_y$$

$$\cong (27,342.699 \text{ MWh} * 0.6096 \text{ tCO}_2\text{e /MWh})$$

$$\cong 16,668 \text{ tCO}_2\text{e}$$

E.2. Project emissions calculation

>>

Follow the registered PDD in accordance with AMS-ID (version 13), the project activity utilizes renewable wind power and there is no anthropogenic emissions by sources of GHG due to the project activity. Thus the project activity emissions equal to zero.y.

Hence, PE_y = 0 tCO₂e

E.3. Leakage calculation

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Follow the registered PDD in accordance with AMS-ID (version 13), leakage does not need to be considered. Thus, LE_y = 0 tCO₂e

E.4. Emission reductions calculation / table

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Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y Emission reductions in year y (tCO₂e/y)

BE_y Baseline Emissions in year y (tCO₂e/y)

PE_y Project emissions in year y (tCO₂e/y)

LE_y Leakage emissions in year y (tCO₂e/y)

$$\begin{aligned} ER_y &= BE_y - PE_y - LE_y \\ &= 16,668 \text{ tCO}_2\text{e} - 0 \text{ tCO}_2\text{e} - 0 \text{ tCO}_2\text{e} \\ &= 16,668 \text{ tCO}_2\text{e} \\ &\approx 16,668 \text{ tCO}_2\text{e} \end{aligned}$$

Thus, emission reduction generated in this monitoring period is 16,668 tCO₂e

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

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Comparison of actual values of the emission reductions achieved during the monitoring period with the estimation in the registered PDD is as follows;

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO ₂ e)	16,903 tCO ₂ e (13,523+13,523*3/12month)	16,668 tCO ₂ e

From above the actual emission reduction of 16,668 tCO₂e is slightly less than the estimated value of 16,903 tCO₂e

E.6. Remarks on difference from estimated value in the PDD

This monitoring period (from 01 Mar. 2010 to 31 May. 2011) is 1 year and 3 months. The actual emission reduction amounts are 16,668 tCO₂, which are less than that estimated in the CDM-PDD (16,903 tCO₂) by 1.3%. It is due to the sunshine.

<Electricity Generated & Emissions Reductions>

(unit: CO₂)

Month-year	BEy Baseline Emissions (tCO2)	PEy Project Emissions (tCO2)	Ply Leakage (tCO2)	ERy Emission Reduction (tCO2)
Mar-10	902.96	0.00	0.00	902.96
Apr-10	1336.14	0.00	0.00	1336.14
May-10	1468.05	0.00	0.00	1468.05
Jun-10	1355.51	0.00	0.00	1355.51
Jul-10	1150.40	0.00	0.00	1150.40
Aug-10	1085.34	0.00	0.00	1085.34
Sep-10	1041.25	0.00	0.00	1041.25
Oct-10	981.81	0.00	0.00	981.81
Nov-10	814.70	0.00	0.00	814.70
Dec-10	547.50	0.00	0.00	547.50
Jan-11	739.50	0.00	0.00	739.50
Feb-11	845.43	0.00	0.00	845.43
Mar-11	1488.15	0.00	0.00	1488.15
Apr-11	1501.87	0.00	0.00	1501.87
May-11	1409.50	0.00	0.00	1409.50
Total	16,668.10	0.00	0.00	16,668.00