

**MONITORING REPORT FORM (F-CDM-MR)**
Version 02.0**MONITORING REPORT**

Title of the project activity	Gangwon Wind Park Project
Reference number of the project activity	0222
Version number of the monitoring report	Version 03
Completion date of the monitoring report	03/10/2012
Registration date of the project activity	20/03/2006
Monitoring period number and duration of this monitoring period	The 6 th Monitoring Period 01/01/2012 - 30/09/2012 (first and last days included)
Project participant(s)	Gangwon Wind Power Co., Ltd. Korea Midland Power Co., Ltd. Ecoeye Co., Ltd. Marubeni Corporation Eurus Energy Japan Corporation
Host Party(ies)	The Republic of Korea Japan
Sectoral scope(s) and applied methodology(ies)	Sectoral Scope 1, Energy Industries Applied Methodology ACM0002 (Version 04, valid from 28/11/2005 to 01/03/2006)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	112,254 tCO ₂ e (149,536 tCO ₂ e/year ÷ 365 x 274days)
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	94,328 tCO ₂ e

SECTION A. Description of project activity**A.1. Purpose and general description of project activity**

>> The Gangwon Wind Park Project (the “Project”) with its nominal installed capacity of 98 MW is based on 49 units of Vestas wind turbines of type V80-2.0MW. The Project is generating electricity without GHG emissions by using wind power categorized under renewable energy and supplies electricity to the public grid using an internal 9.764 km (6.746 km overhead and 3.018 km underground), 154 kV power line to the local substation of the KEPCO (Korea Electricity Power Company) in Hoenggye. The Project started construction on 12/05/2005, commissioning on 02/12/2005 and commercial operation of all 49 units since 01/09/2006.

Total emission reductions achieved in this monitoring period are 94,328 tCO₂e.

A.2. Location of project activity

>> The Project site is located in 475-2 Hoenggyei-2Ri, Daegwallyeong-Myun, Pyeongchang-Gun, Gangwon-Do, the Republic of Korea along the Daegwallyeong ridge in the eastern part of the Korean peninsula.

GPS coordinates (Tokyo datum) of the Project location are North Latitude from 37° 42’ 14” to 37° 45’ 29” and East Longitude from 128° 41’ 49” to 128° 44’ 52”.

A.3. Parties and project participant(s)

Party involved (host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
The Republic of Korea (host)	Gangwon Wind Power Co., Ltd. Korea Midland Power Co., Ltd. Ecoeye Co., Ltd.	No
Japan	Marubeni Corporation Eurus Energy Japan Corporation	No

A.4. Reference of applied methodology

>> The title of the approved baseline methodology applied to the project activity is ACM0002 (Version 04, valid from 28/11/2005 to 01/03/2006) – “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” and the title of the approved monitoring methodology applied to the project activity is ACM0002 (Version 04, valid from 28/11/2005 to 01/03/2006) – “Consolidated monitoring methodology for grid-connected electricity generation from renewable sources”.

The determination of the additionality is done by using the “Tool for the demonstration and assessment of additionality” (Version 01, EB 16 Annex 01, 22/10/2004).

A.5. Crediting period of project activity

>> Provided type of crediting period of the project activity is 1 term of 10 years. The starting date of the fixed crediting period for the project activity is 31/12/2006 and lasts until 30/12/2016.

SECTION B. Implementation of project activity**B.1. Description of implemented registered project activity**

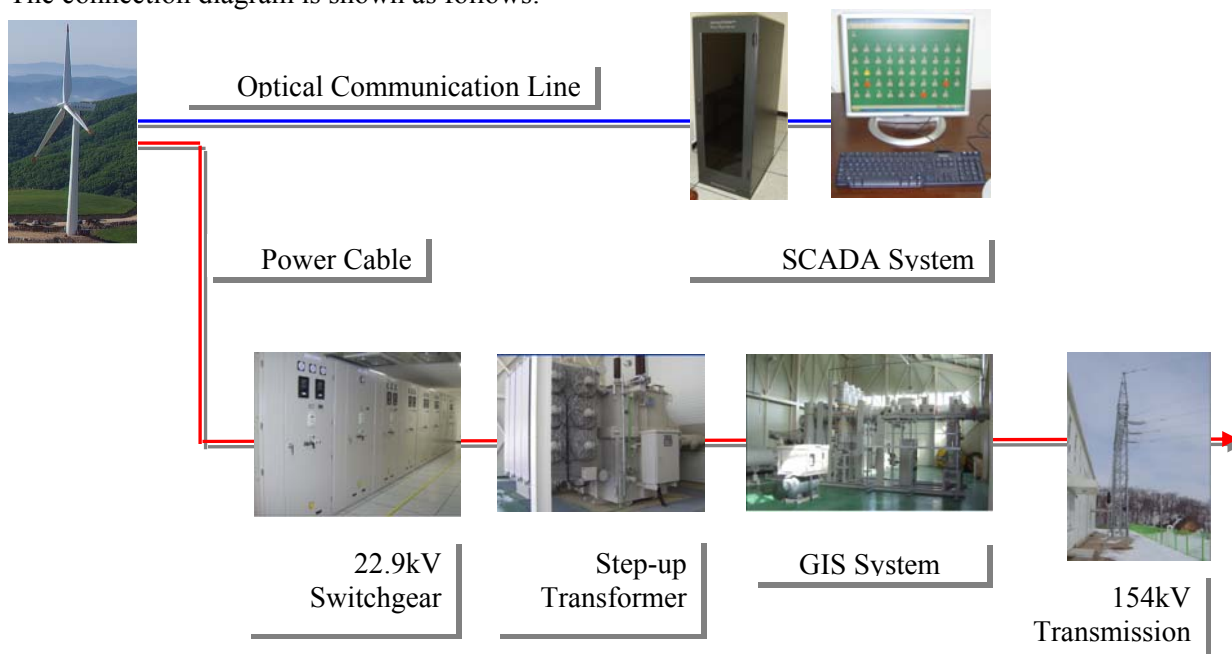
>>During this monitoring period, the average wind speed is 7.1 m/s, electricity generation is 155,221 MWh, capacity factor is 24.1% and availability is 99.2%.

Major maintenance works in this monitoring period are 1 generator replacement for WTG No. 48 on 20/04/2012, 1 blade replacement due to lightning damage for WTG No. 3 on 12/08/2012 and 1 blade replacement due to typhoon damage for WTG No. 19 on 26/09/2012.

The Project is the largest wind power generation project in the Republic of Korea with the total capacity of 98 MW. Specifications of Vestas V80-2.0MW wind turbines are as follows:

Rated Power:	2 MW
Cut in Speed:	4 m/s
Rated Speed:	15 m/s
Cut out Speed:	25 m/s
Blade Diameter:	80 m
Hub Height:	60 m
Gearbox:	3 Class, Ratio 1:120
Output Control:	Variable Speed Pitch Control
Noise Level:	56.4 db(A) at 107 m

The connection diagram is shown as follows:

**B.2. Post registration changes****B.2.1. Temporary deviations from registered monitoring plan or applied methodology**

>>There was no temporary deviation.

B.2.2. Corrections

>>There was no correction.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

>> Revised monitoring plan as reference title of “Request for the revision of the monitoring plan of Gangwon Wind Park Project (0222)” due to discrepancy of calibration frequency had been submitted on 20/01/2010 and approved on 15/03/2010. There was no further revision of the monitoring plan in this monitoring period.

B.2.4. Changes to project design of registered project activity

>> There was no change to project design.

B.2.5. Changes to start date of crediting period

>> There was no change to start date of crediting period.

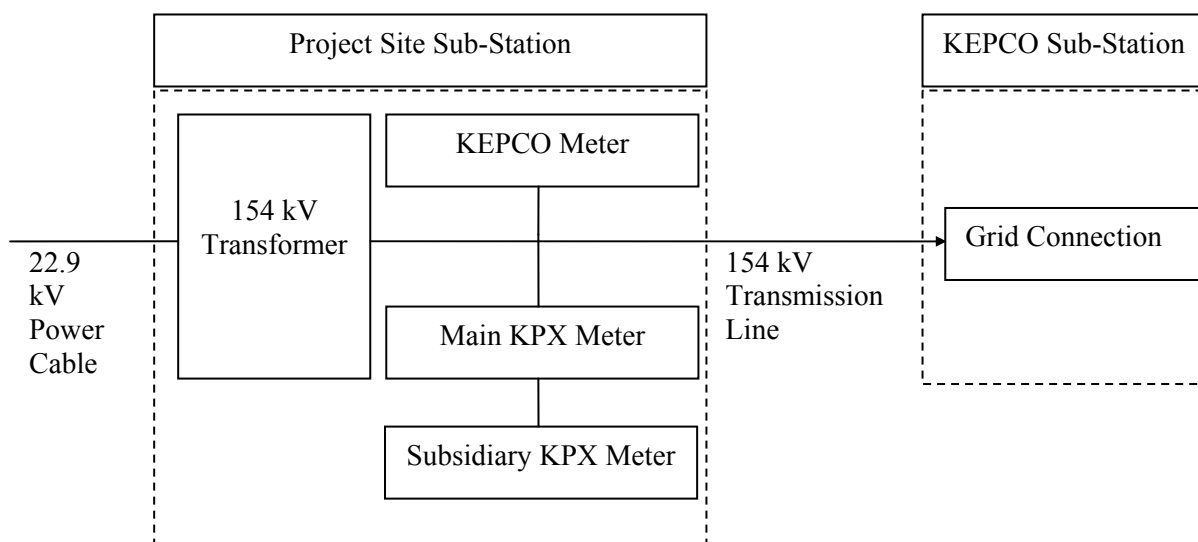
B.2.6. Types of changes specific to afforestation or reforestation project activity

>> There was no type of change specific to afforestation or reforestation project activity.

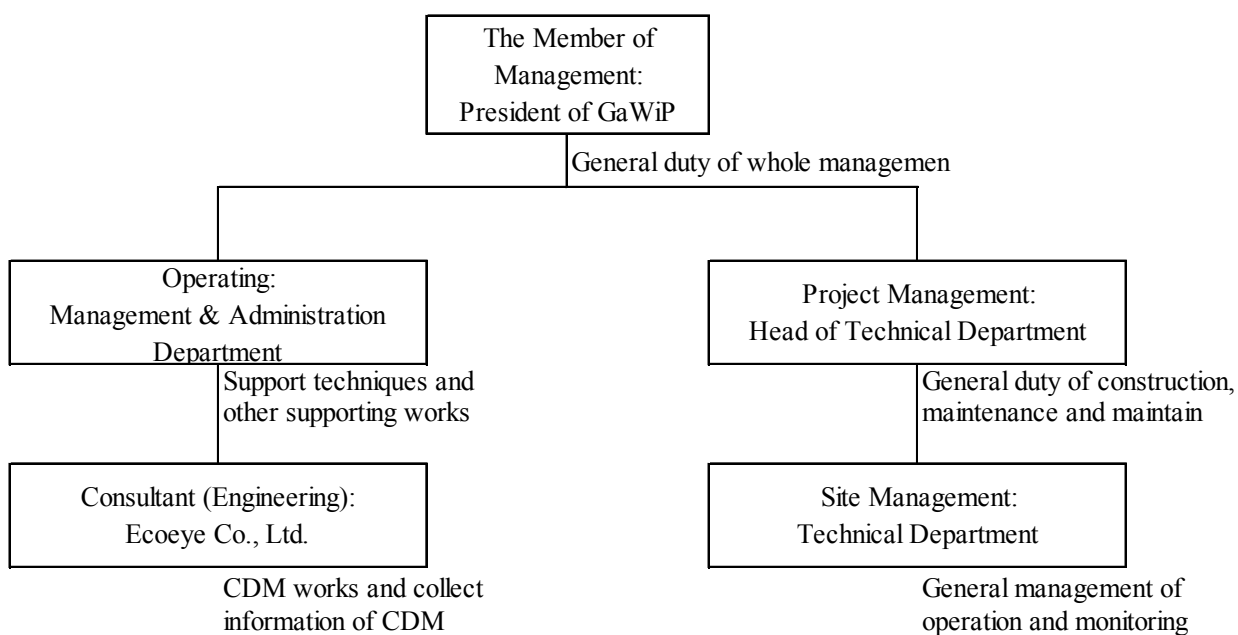
SECTION C. Description of monitoring system

>> The KPX (Korea Power Exchange) electricity meters (one main and one subsidiary) for measuring the amount of delivered electricity to the grid of KEPCO (Korea Electricity Power Company) is sealed after confirmation on the correct set up of the meters by KPX. The main KPX electricity meter is 0.2 class watt-hour meter to measure the amount of delivered electricity, which is wireless transmitted to KPX on real time basis, as the standard for calculation of power generation and revenue. The subsidiary KPX electricity meter is 0.5 class watt-hour meter that KPX could collect measured amount by remote access when main KPX electricity meter is not available. The amount of obtained electricity consume in the Project is measured by one KEPCO watt-hour meter.

The schematic diagram of the metering system is shown as follows:

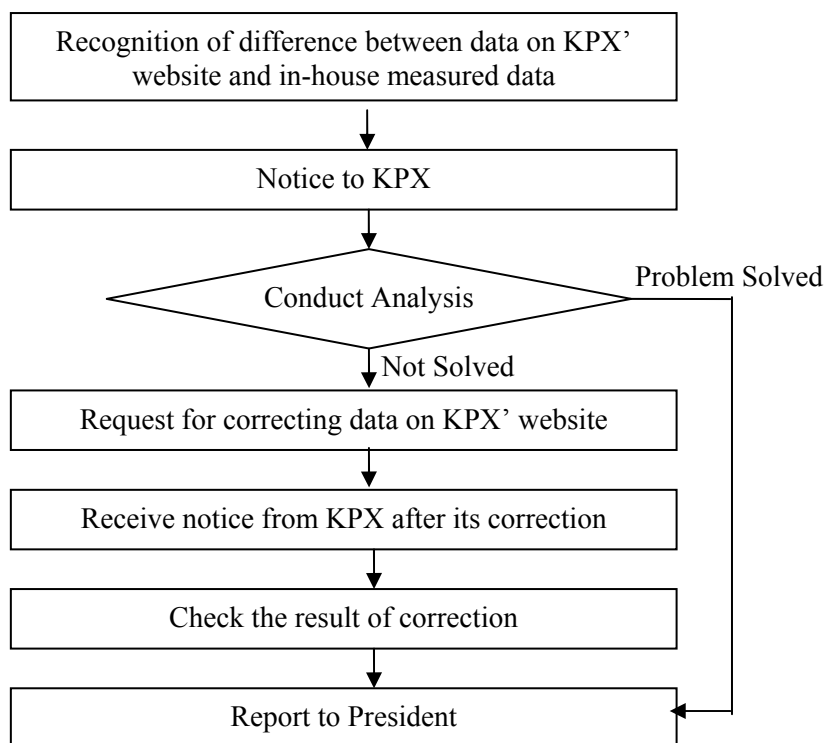


In accordance with monitoring plan, the operational and management structure to monitor emission reductions generated by the project activity is set up as follows:



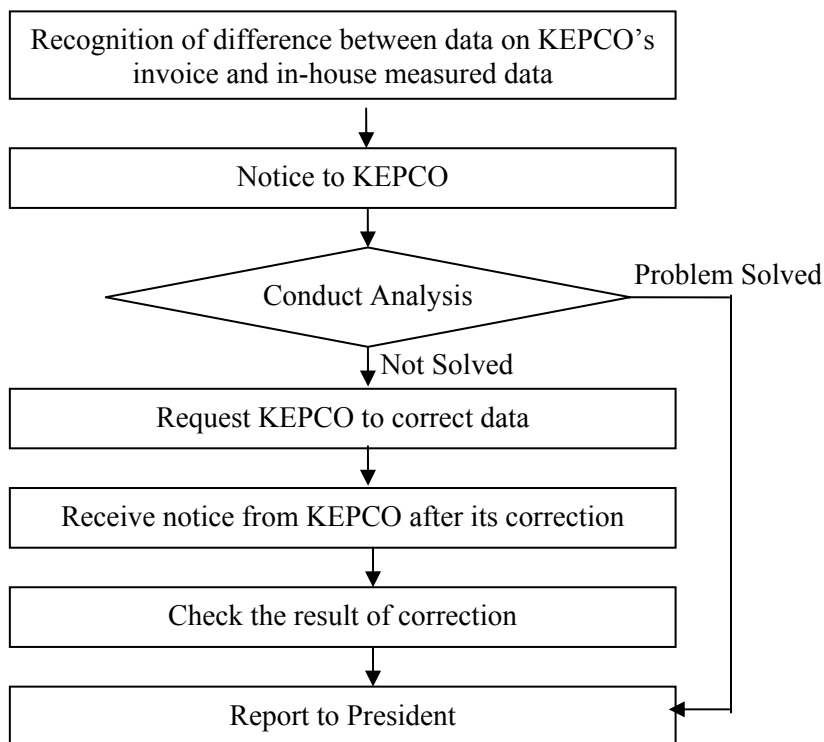
The amount of electricity delivered to the grid is measured automatically by the KPX meters and wireless transmitted to KPX on real time basis. The assigned monitoring members of the project activity collect and store the measured data electronically on hourly, daily, weekly and monthly basis. The measured data is double-checked against collected data on KPX' website and KPX' receipt of sales.

If the data on KPX' website and in-house measured data are different, following emergency procedures will be progressed.



The amount of electricity consumed by the Project site is daily checked by reading the KEPCO meter and compared with monthly KEPCO's invoice.

If the data on the KEPCO's invoice and in-house measured data are different, following emergency procedures will be progressed.



SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

(Copy this table for each piece of data and parameter.)

Data/Parameter	EF _y
Unit	tCO ₂ e/MWh
Description	Baseline emission factor
Source of data	Registered PDD
Value(s) applied	0.6119
Purpose of data	This data is used for baseline emission calculation.
Additional comment	N/A



Data/Parameter	R_1
Unit	Ω
Description	Wire Resistance of one transmission line
Source of data	Specifications of transmission cable maker
Value(s) applied	0.813
Purpose of data	This data is used for transmission loss calculation.
Additional comment	$(0.0282 \Omega/\text{km} \times 3.018\text{km}) + (0.108\Omega/\text{km} \times 6.746\text{km}) = 0.813 \Omega$

D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter.)

Data/Parameter	Electricity delivered		
Unit	MWh		
Description	Electricity delivered to the grid		
Measured/Calculated/Default	Measured		
Source of data	Daily records of KPX (Korea Power Exchange) electricity meter		
Value(s) of monitored parameter	155,220.859		
Monitoring equipment	KPX Meter	Main	Subsidiary
	Type	SC8000AY1B_b	TWR-ALM1
	Accuracy Class	0.2	0.5
	Serial Number	AR-0111A064-02	4349760
	Calibration Frequency	3 years and 6 months \pm 6 months from last calibration	3 years and 6 months \pm 6 months from last calibration
	Previous Calibration Date	29/09/2009	29/09/2009
	Validity	28/09/2013	28/09/2013
	Last Calibration Date	11/09/2012	11/09/2012
	Validity	10/09/2016	10/09/2016
Measuring/Reading/Recording frequency	This data is continuously measured, hourly read and daily recorded.		
Calculation method (if applicable)	N/A		
QA/QC procedures	Double-check against collected data on KPX' website and KPX' receipt of sales.		
Purpose of data	This data is used for baseline emission calculation.		
Additional comment	N/A		



Data/Parameter	Electricity obtained	
Unit	MWh	
Description	Electricity obtained from the grid	
Measured/Calculated/Default	Measured	
Source of data	Monthly records of KEPCO (Korea Electricity Power Company) electricity meter	
Value(s) of monitored parameter	819.603	
Monitoring equipment	KEPCO Meter	
	Type	LK3410CP-005
	Accuracy Class	1.0
	Serial Number	1298472
	Calibration Frequency	every year
	Previous Calibration Date	06/09/2011
	Validity	31/12/2012
	Last Calibration Date	26/09/2012
	Validity	31/12/2013
Measuring/Reading/Recording frequency	This data is continuously measured, daily read and monthly recorded.	
Calculation method (if applicable)	N/A	
QA/QC procedures	Compare with monthly KEPCO's invoice.	
Purpose of data	This data is used for baseline emission calculation.	
Additional comment	N/A	



Data/Parameter	Delivered Transmission Loss
Unit	MWh
Description	Delivered transmission loss to the grid
Measured/Calculated/Default	Calculated
Source of data	N/A
Value(s) of monitored parameter	244.491
Monitoring equipment	N/A
Measuring/Reading/Recording frequency	N/A
Calculation method (if applicable)	$I_p = P / (1.732 \times V \times T)$ $I = I_p / PF$ $MW \text{ Loss} = I^2 R_3 / 1,000$ $MWh \text{ Loss} = I^2 R_3 \times T / 1,000$ <p>P : Delivered power to the grid (measured) T : Time period (hours) I : Current on the transmission line for delivered power PF : Power Factor of delivered (0.997) R₁ : Wire Resistance of one transmission line (0.813 Ω) R₃ : Wire Resistance of three transmission lines V : Voltage on the transmission line (158kV)</p>
QA/QC procedures	Delivered transmission loss is calculated by daily basis.
Purpose of data	This data is used for baseline emission calculation.
Additional comment	Values of delivered transmission loss are referred to CER Calculation Spreadsheet_2012.



Data/Parameter	Obtained Transmission Loss
Unit	MWh
Description	Obtained transmission loss from the grid
Measured/Calculated/Default	Calculated
Source of data	N/A
Value(s) of monitored parameter	0.0038 (Rounded to the forth position after decimal point.)
Monitoring equipment	N/A
Measuring/Reading/Recording frequency	N/A
Calculation method (if applicable)	$I_p = P / (1.732 \times V \times T)$ $I = I_p / PF$ $MW \text{ Loss} = I^2 R_3 / 1,000$ $MWh \text{ Loss} = I^2 R_3 \times T / 1,000$ <p> P : Obtained power from the grid (measured) T : Time period (hours) I : Current on the transmission line for obtained power PF : Power Factor of obtained (1.000) R_1 : Wire Resistance of one transmission line (0.813 Ω) R_3 : Wire Resistance of three transmission lines V : Voltage on the transmission line (158kV) </p>
QA/QC procedures	Obtained transmission loss is calculated by monthly basis.
Purpose of data	This data is used for baseline emission calculation.
Additional comment	Values of obtained transmission loss are referred to CER Calculation Spreadsheet_2012.

Data/Parameter	EG _y
Unit	MWh
Description	Net electricity delivered to the grid by the project activity
Measured/Calculated/Default	Calculated
Source of data	N/A
Value(s) of monitored parameter	154,156.761
Monitoring equipment	N/A
Measuring/Reading/Recording frequency	N/A
Calculation method (if applicable)	Electricity Delivered – (Electricity Obtained + Delivered Transmission Loss + Obtained Transmission Loss)
QA/QC procedures	N/A
Purpose of data	This data is used for baseline emission calculation.
Additional comment	N/A

D.3. Implementation of sampling plan

>>N/A

SECTION E. Calculation of emission reductions or GHG removals by sinks**E.1. Calculation of baseline emissions or baseline net GHG removals by sinks**

>> The baseline emissions (BE_y in tCO_2e) are the product of the baseline emission factor (EF_y in tCO_2e/MWh) times the electricity supplied by the project activity to the grid (EG_y in MWh), as follows:

$$\begin{aligned} BE_{2012} &= EG_{2012} \times EF_{2012} \\ &= 154,156.761 \text{ MWh} \times 0.6119 \text{ tCO}_2e/\text{MWh} \\ &= 94,328.522 \text{ tCO}_2e \end{aligned}$$

The baseline emission factor EF_y was calculated in accordance with the ACM0002 baseline methodology and is based on the methodology and parameters fixed in the PDD and justified during the validation. One produced MWh of electricity replaces 0.6119 ton of CO_2e , i.e. $EF_y = 0.6119 \text{ tCO}_2e/\text{MWh}$.

Electricity consumed by the project activity is used from the own wind power generation and is obtained from the grid at times when the own wind power generation is not sufficient. Correspondingly, all electricity consumed by the project activity is considered in the calculation of EG_y by subtracting electricity obtained from the grid from electricity delivered to the grid.

The wind park is located on a mountain ridge and supplies electricity to the public grid using an internal 9.764 km (6.746 km overhead and 3.018 km underground), 154 kV power line to the local substation of the KEPCO in Hoenggye. The same power line is used for electricity obtained from the grid. The detailed transmission losses have been calculated as described in the separate MS Excel 'CER Calculation Spreadsheet_2012' and the final results are as follows:

Transmission losses for electricity amount delivered to the grid: 244.491 MWh
Transmission losses for electricity amount obtained from the grid: 0.0038 MWh

The following table shows the results of the baseline emissions during the present monitoring period (01/01/2012 to 30/09/2012). Electricity delivered to the grid (KPX meter) and electricity obtained from the grid and consumed on site (KEPCO meter) is specified separately to determine the net electricity supplied to the grid by the project activity in the monitoring year 2012.

Month	Electricity Delivered (MWh)	Electricity Obtained (MWh)	Delivered Transmission Loss (MWh)	Obtained Transmission Loss (MWh)	EG ₂₀₁₂ (MWh)	EF ₂₀₁₂ (tCO ₂ e/MWh)	BE ₂₀₁₂ Baseline Emission (tCO ₂ e)
	A	B	C	D	E=A-(B+C+D)	F	G=E*F
January	22,446.426	58.357	35.402	0.0001491	22,352.667	0.6119	13,677.597
February	23,465.252	72.623	43.493	0.0002468	23,349.136	0.6119	14,287.336
March	23,405.726	84.944	41.792	0.0003159	23,278.990	0.6119	14,244.414
April	23,469.750	47.335	38.406	0.0001014	23,384.009	0.6119	14,308.675
May	11,942.534	102.450	12.718	0.0004595	11,827.366	0.6119	7,237.165
June	6,544.741	164.699	7.357	0.0012270	6,372.684	0.6119	3,899.445
July	18,691.264	79.107	27.106	0.0002739	18,585.051	0.6119	11,372.193
August	13,600.486	94.670	21.842	0.0003923	13,483.974	0.6119	8,250.843
September	11,654.680	115.418	16.375	0.0006026	11,522.886	0.6119	7,050.854
October						0.6119	
November						0.6119	
December						0.6119	
Total	155,220.859	819.603	244.491	0.003768	154,156.761		94,328.522

E.2. Calculation of project emissions or actual net GHG removals by sinks

>> The operation of the project activity has been monitored in accordance with the requirements of the applicable monitoring methodology as described in its PDD and in the approved monitoring methodology ACM0002 (Version 04), which is the consolidated monitoring methodology for zero-emission grid-connected electricity generation from renewable energy sources.

There are no GHG emissions from the project activity so that the project emissions are zero.

E.3. Calculation of leakage

>> The leakage of the project activity is considered zero in accordance with the applied methodology.

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO ₂ e)	Project emissions or actual net GHG removals by sinks (tCO ₂ e)	Leakage (tCO ₂ e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO ₂ e)
Total	94,328.522	0	0	94,328.522

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO₂e)	112,254	94,328

**E.6. Remarks on difference from estimated value in registered PDD**

>> The estimated emission reduction in the PDD is 112,254 tCO₂e (149,536 tCO₂e/year ÷ 365 x 274days) based on an electricity generation of 183,467MWh (244,400MWh/year ÷ 365 x 274days). The electricity generation of 155,221 MWh from 01/01/2012 to 30/09/2012 is lower than the long-term average annual estimation because the average wind speed of 7.1m/sec during this monitoring period is lower than long-term average annual estimation of 7.65m/sec and this monitoring period does not include most windy season of November and December. The project activity has achieved 94,328 tCO₂e of emission reductions, which is 16% lower than the estimation in the PDD.

History of the document

Version	Date	Nature of revision
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance		