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

MONITORING REPORT

Title of the project activity	3MW Shinan Wind power project
Reference number of the project activity	3110
Version number of the monitoring report	01.2
Completion date of the monitoring report	21/03/2013
Registration date of the project activity	18/04/2010
Monitoring period number and duration of this monitoring period	- Monitoring period number : 1st - Duration of this monitoring period : 18/04/2010 ~ 17/04/2012
Project participant(s)	Shinan wind power Co., Ltd.
Host Party(ies)	Republic of Korea
Sectoral scope(s) and applied methodology(ies)	AMS-I.D (Version 13)
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	7,802 ton CO_2
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	8,184 ton CO_2

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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- The purpose of the project activity and Measures taken to reduce green house gas emission

The purpose of the project is contributes to the international effort to prevent global warming by using renewable energy. The wind power plant generates electricity utilizing wind energy which emits zero greenhouse gas (GHG) into the atmosphere or water system without any natural resources depletion. The project supports the government policy which promotes development of renewable energy technology in Republic of Korea. The project also contributes to decrease dependence on electricity generated by thermal power plants using fossil fuel which takes 63.1% of electricity generation in Korea (Source: Statistics of Electric Power in 2007, KEPCO 2008).

- Brief description of the installed technology and equipment

Shinan Wind power plant consists of 3 installed wind power turbine-generator unit capacity is 1,000kW, the total capacity of 3 installed wind power turbine-generator units is 3.0MW.

Rotor transforms kinetic energy of wind into rotational energy. And then induction generator produces power using rotational energy.

- Rotor system: transforms wind energy into rotational energy
- Power delivery system: delivers rotational energy to electricity transformation system.
- Electricity interconnection system: transforms rotational energy into electricity energy and makes produced power be satisfied in the quality of electricity interconnection
- Assistants system: control device, rotor, steel tower, structure and etc.

Classification	Details
The number of turbines	3
Total installed wind power turbine-generator unit Capacity	1,000kW × 3 = 3.0MW
The amount of electric energy	6,400,000 kWh/yr

- Relevant dates for the project activity

Item	Shinan Wind power plant
Completion of construction	31/12/2008
Starting date of operation	27/11/2008
Commissioning date	24/12/2008

- Total emission reductions achieved in this monitoring period : 8,184 tonCO_2

A.2. Location of project activity

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- Host party (ies);

Republic of Korea

- Region/ State/ Province, etc.

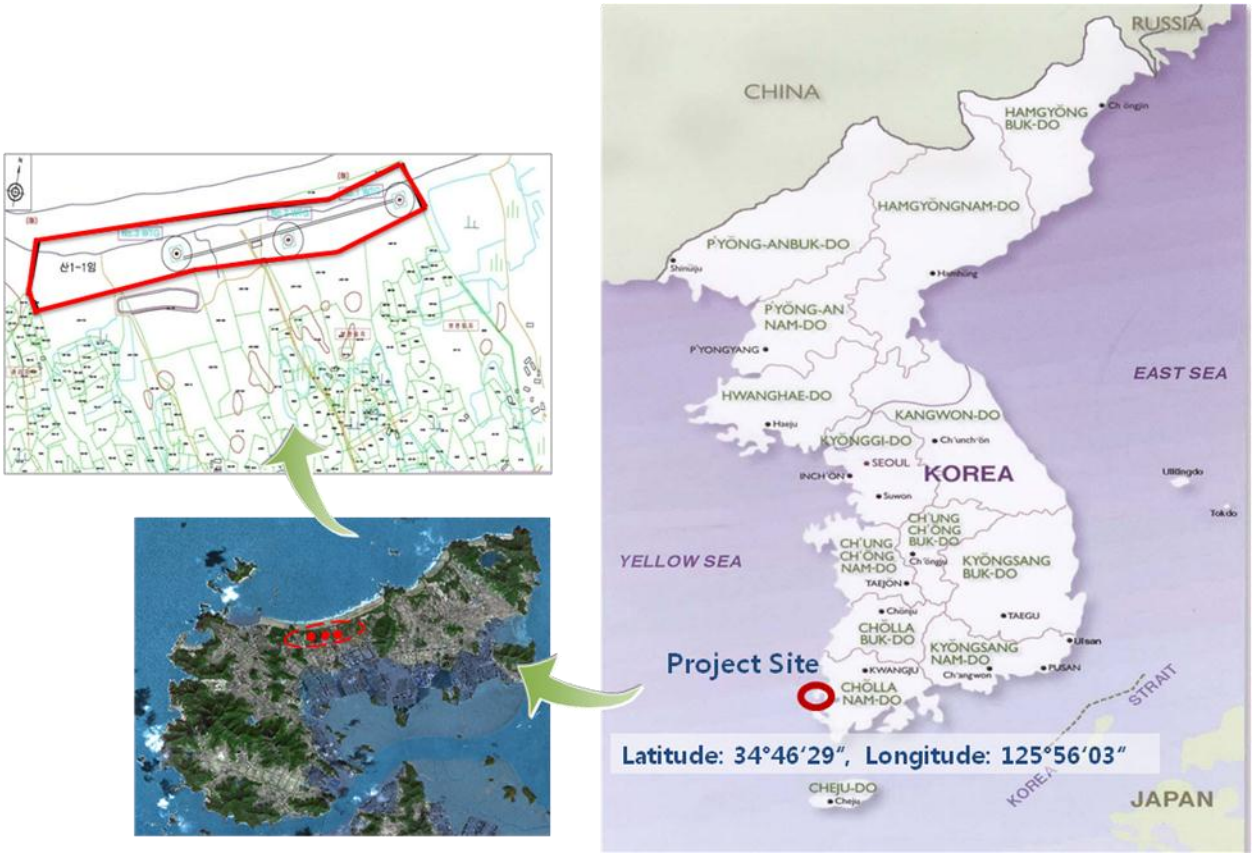
Jeollanam-do

- City/ Town/ Community,

San 1-1, Gurim-ri, Bigeum-myeon, Shinan-gun

- Physical/ Geographical location.

The project site is located at the East 125°56’03”, North 34° 46’29” that is seashore of the Bigeum Island.



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)
Republic of Korea (host)	Private entity : Shinan wind power Co., Ltd.	NO

A.4. Reference of applied methodology

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- Applied methodology

Type: I – Renewable energy projects

Category: I.D – Grid connected renewable electricity generation (Version 13)

- Tools referenced in this methodology

"Tool to calculate the emission factor for an electricity system" (Version 01.1)

A.5. Crediting period of project activity

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Starting date of the first crediting period: 18/04/2010

Length of the total crediting period: 7 years (18/04/2010 ~ 17/04/2017)

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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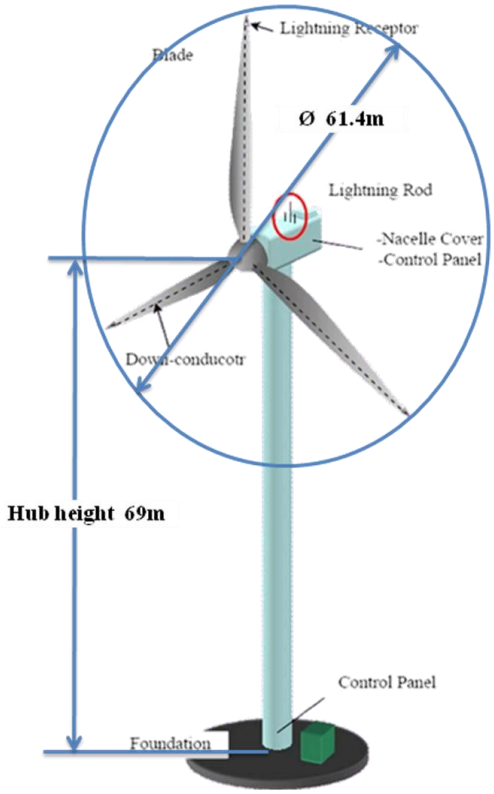
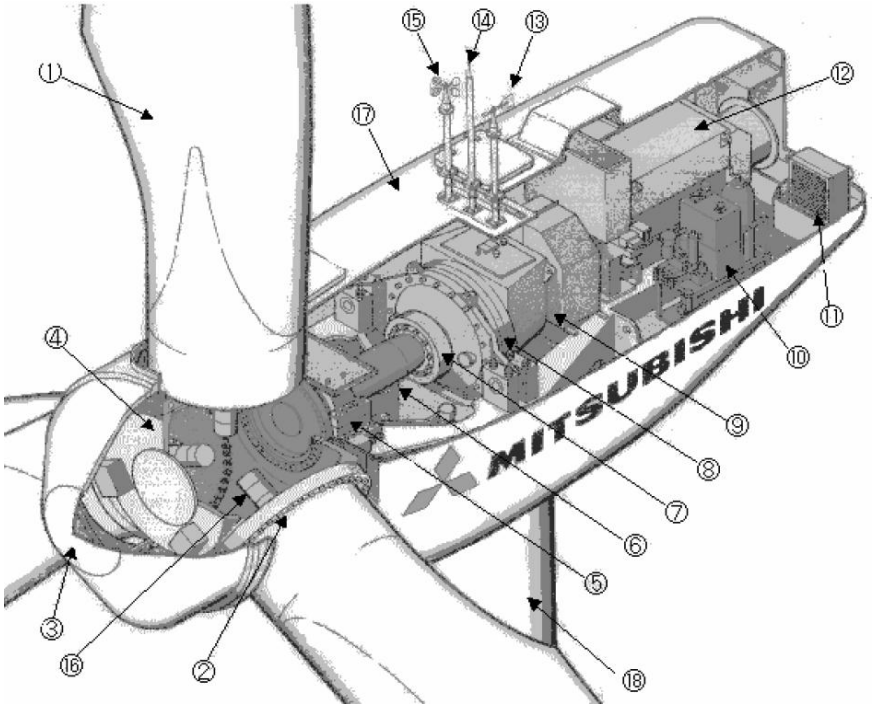
- The description of the installed technology

Installed wind power turbine-generator unit has capacity 1,000kW × 3units. The project will generate 6,400,000kWh/yr with 24.4% efficiency and supply the electricity to the grid. Also average wind velocity is 6.1m/s at a height of 70m. Detailed specification is as follow.

Classification		Details
Manufacturer		Mitsubishi
Blade	Material	Glass fiber reinforced plastics
	Rotor diameter	61.4m
	Swept area	2,960m^2
	The number of blade	3
Turbine (MWT-1000A)	Type	Induction generator
	Wind velocity	12.5m/s
	Output Voltage	600V
	Output power	1,000kW
	Rated Speed	19.8rpm
	Cooling system	Air cooling
Generator (HRQ1 455-48E)	Output Power	1,100kW
	Output Voltage	600V
Steel Tower	Type	Tubular
	Height	66.9m



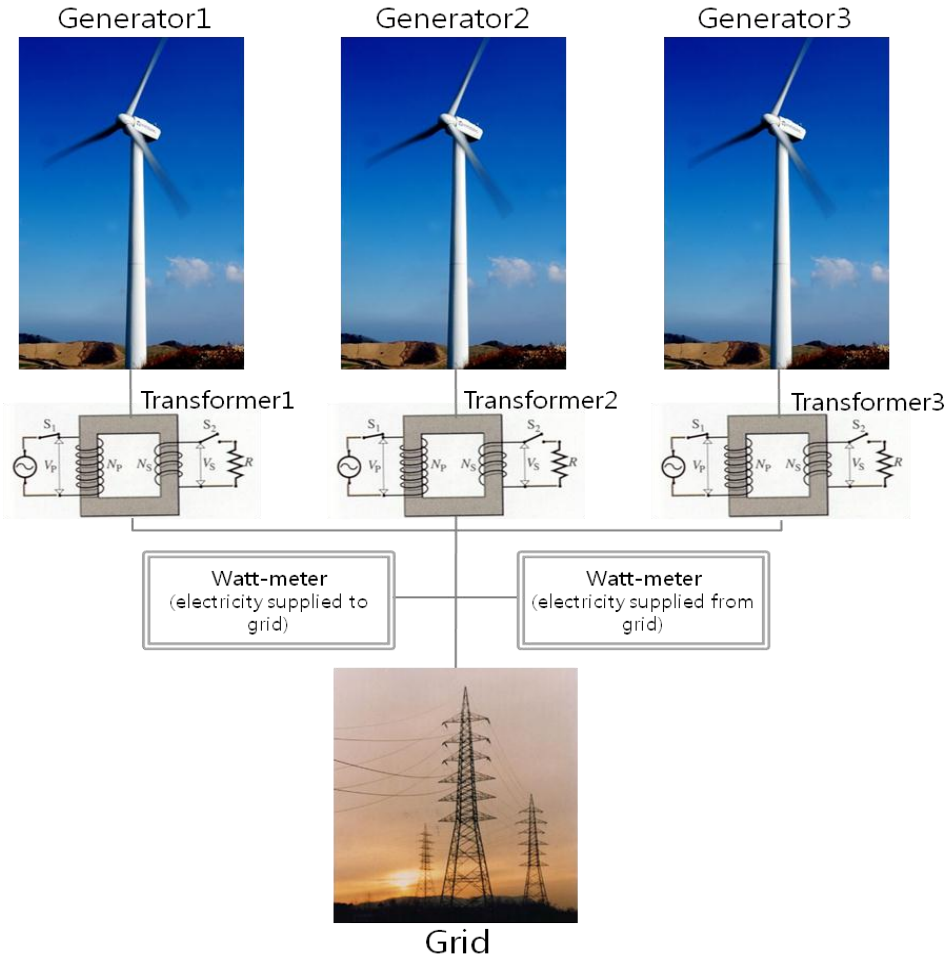


Parts

① Blade
② Blade Bearing
③ Front Capsule
④ Rotor Head
⑤ Main Bearing
⑥ Main Shaft
⑦ Coupling (Low Speed)
⑧ Gear Box
⑨ Coupling (High Speed)
⑩ Hydraulic Unit
⑪ L.O. Cooler (with Fan)
⑫ Generator
⑬ Wind Vane
⑭ Lightning Rod
⑮ Anemometer
⑯ Hydraulic Pitch Link System
⑰ Nacelle
⑱ Tower

- Technical process

Electricity is generated from three installed wind power turbine-generators units whose total capacity is 3.0MW. The amount of generated electricity depends on the weather situation. Generated electricity is transmitted to the Grid directly. In the middle of the process, there are three transformers which convert D/C (direct current) to A/C (altering current) for decreasing transmission loss. And then the high voltage electricity is transmitted to close substation by power cables. Electricity supplied from the grid and supplied to the grid is checked by watt-hour meters. Below is the diagram of technical process.



- Relevant dates of project activity

Item	Shinan Wind power plant
Completion of construction	31/12/2008
Starting date of operation	27/11/2008
1st Monitoring peroid	18/04/2010 ~ 17/04/2012
Installation date of imported electricity meter	28/11/2008
Installation date of exported electricity meter	26/11/2008

- The information on the implementation status of the project activity

During the monitoring period, there were 3 regular overhauls and 14 Downtimes happened. And 14 times of equipment exchange implemented but there was no serious situation. Below is the information table on the implementation status.

Item	Shinan Wind power plant		
	2010	2011	2012
Overhaul	1	2	0
Downtimes	6	7	1
Exchange of equipment	7	6	1

In case of overhaul, there are three kinds of maintenances which are 1 year anniversary maintenance, half year anniversary maintenance and 2 years anniversary maintenance. In 2010, 1year anniversary was conducted and the others were conducted in 2011 for 3 or 4 months. Details were general maintenances such as machine visual check, electric visual check, clean up in the towers.

Downtimes and exchange of equipment happened 14 times for the monitoring period. Below are the detail tables.

Accident date		Details of an accident	Restoration date		Corrective action
31/05/10’	09:30	Damage of the oil pressure circulation pump at WTG No.1	31/05/10’	20:30	Change of the oil pressure circulation pump and filter
29/08/10’	22:50	Accumulator charge insufficient at WTG No.2	01/09/10’	10:47	Change of the relief valve and accumulator and recharge of oil pressure
12/09/10’	04:01	Damage of the VCB digital power meter’s LCD panel at WTG No.3	13/09/10’	10:38	Change of the VCB digital power meter
04/11/10’	13:01	Blade pitch control fault at WTG No.2	25/11/10’	09:40	Change of the prop-valve and G.Y Sensor
29/11/10’	08:19	G.O pump motor overload at WTG No.1	30/11/10’	18:00	Change of the oil hydraulic motor
20/12/10’	09:03	Accumulator charge insufficient at WTG No.1	21/12/10’	17:00	Change of the accumulator
30/12/11’	21:36	Damage of the surge protector at WTG No.3	03/01/11’	12:00	Change of the surge protector
17/01/11’	18:57	L.O cooler fan motor overload at WTG No.3	18/01/11’	18:54	Change of the L.O cooler motor
30/04/11’	03:00	Damage of the transformer at electric room	02/05/11’	14:00	- Supply of the temporary electric power - Change of the cable and cleaning the transformer
30/05/11’	09:30	Damage of the oil pressure circulation pump at WTG No.2	30/05/11’	21:30	Change of the oil pressure circulation pump
19/08/11’	10:22	UPS battery charge fault at WTG No.1	19/08/11’	11:00	Change of the UPS battery
21/08/21’	00:00	Accumulator charge insufficient at WTG No.3	23/08/11’	19:05	Change of the accumulator
27/10/11’	09:00	MCCB1 fault at WTG No.2	24/11/11’	16:00	Change of the MCCB1
05/03/12’	13:47	L.O cooler fan motor overload at WTG No.2	07/03/12’	23:03	Change of the L.O cooler motor

- Events or situations which may impact on the applicability of the methodology

There were no special events may impact on the applicability of methodology such as increases or decreases in capacity of facilities. The project was operational as normal and the electricity produced by the project is daily recorded during the monitoring period.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

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There are no temporary deviations.

B.2.2. Corrections

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- Wind power electric equipment specification

Specification of wind power electric equipment was incorrectly stated as the specification of generator in the registered the PDD. Therefore, actual generator (model No. HRQ1455-48E) was added in the table and reflected in the revised the PDD. Below table is the change.

Registered the PDD			**Changes**		
Classification		**Details**	**Classification**		**Details**
Manufacturer		Mitsubishi	Manufacturer		Mitsubishi
Generator (MWT-1000A)	Type	Induction generator	Turbine (MWT-1000A)	Type	Induction generator
	Wind velocity	12.5m/s		Wind velocity	12.5m/s
	Output Voltage	600V		Output Voltage	600V
	Output power	1,000kW		Output power	1,000kW
	Rotational Speed	19.8rpm		Rotational Speed	19.8rpm
	Cooling system	Air cooling		Cooling system	Air cooling
Steel Tower	Type	Tubular	Generator (HRQ1 455-48E)	Output Power	1,100kW
	Height	66.9m		Output Voltage	600V
			Steel Tower	Type	Tubular
				Height	66.9m

- Management of monitoring and electricity safety

In the registered PDD, management of monitoring stated as person in charge of monitoring and electricity safety shall attend the following courses three times per year.

- Course on “Law regarding measurement”
- Course on “Act on operation of electricity market”
- Course on “Electricity safety”

However, According to the ‘Law on Electricity business’, the course on ‘Electricity safety’ must be attended by the person in charge of monitoring and electricity safety once every three years. In addition, there is no official course on ‘Law regarding measurement’ in Republic of Korea and no regulation on training frequency about the course on ‘Act on operation of electricity market’. Therefore, each course was changed to below.

Classification	3. Management of monitoring and electricity safety
Registered PDD	Person in charge of monitoring and electricity safety shall attend the following

	courses once three times per year. - Course on ′Law regarding measurement′ - Course on ′Act on operation of electricity market - Course on Electricity safety
Changes	Person in charge of monitoring and electricity safety shall attend the following courses once every three years. - Course on Electricity safety The course on 'Act on operation of electricity market' shall be attended once in case of replacing the person in charge of monitoring and electricity safety.

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

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- QA/QC procedures to be applied

In the registered PDD, the allowable error of data must be within ± 0.5%. However, it is for only exported electricity meter not imported electricity meter. In the process of registration of PDD, allowable error of data for imported electricity meter was missing. Therefore, allowable error for imported electricity meter was added. Below table is the change.

Registered the PDD		Changes	
QA/QC procedures to be applied:	- Uncertainty of data is low - QA/QC procedure for this is planned. - The allowable error of data must be within ± 0.5%.	QA/QC procedures to be applied:	- Uncertainty of data is low - QA/QC procedure for this is planned. - The allowable error of data must be within ± 0.5%. - Regarding the imported electricity meter, its allowable error must be within ± 1.0% .

In accordance with 'Power market operation regulations', allowable error for imported electricity meter can be within ± 2.0%, if equipment capacity is from 500kW to 10,000kW. Therefore, 1% allowable error is valid.

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

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There are no changes to project design of registered project activity.

B.2.5. Changes to start date of crediting period

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There are no changes to start date of crediting period.

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

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Not applicable

SECTION C. Description of monitoring system

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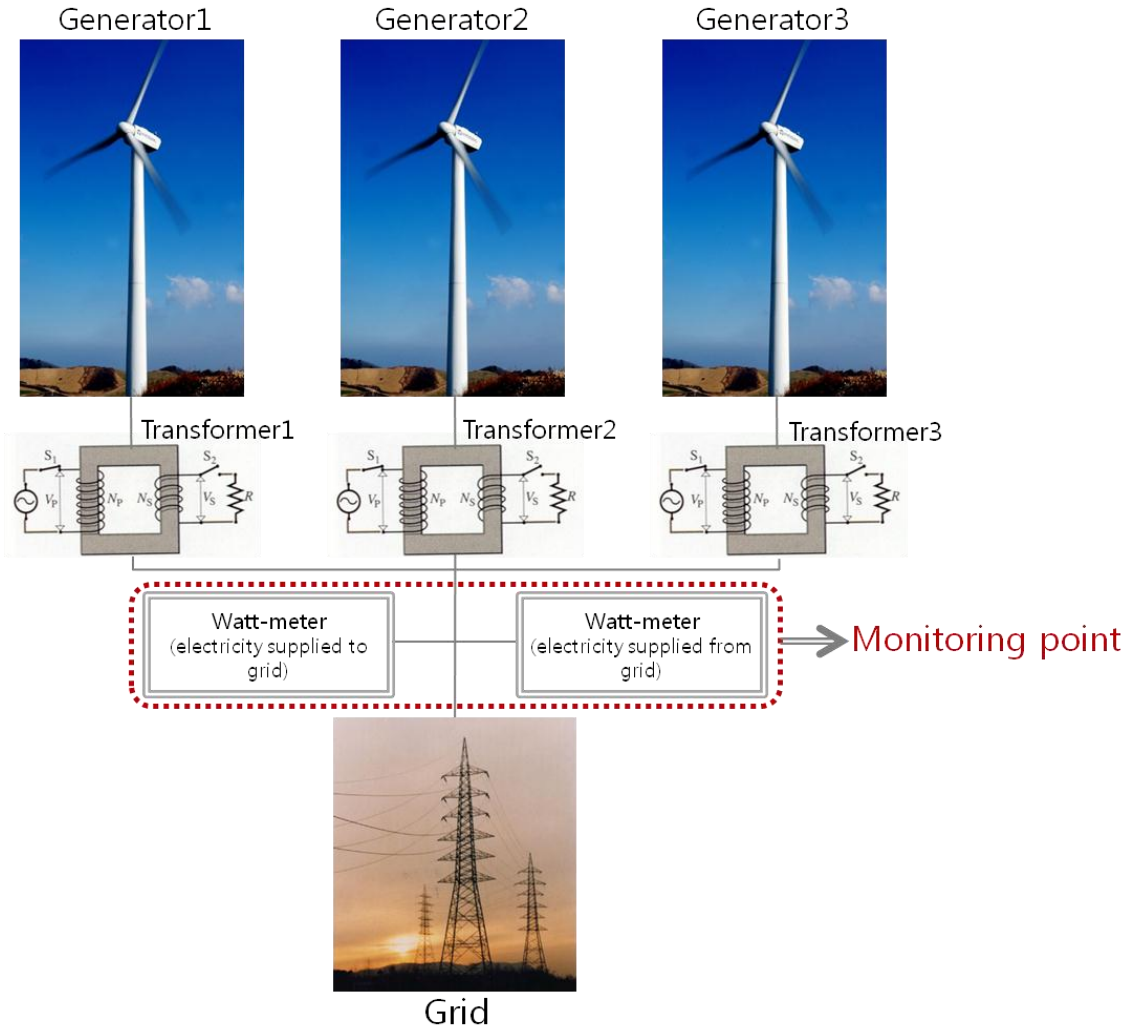
- Data collection procedure

Data collection procedures are as followings.

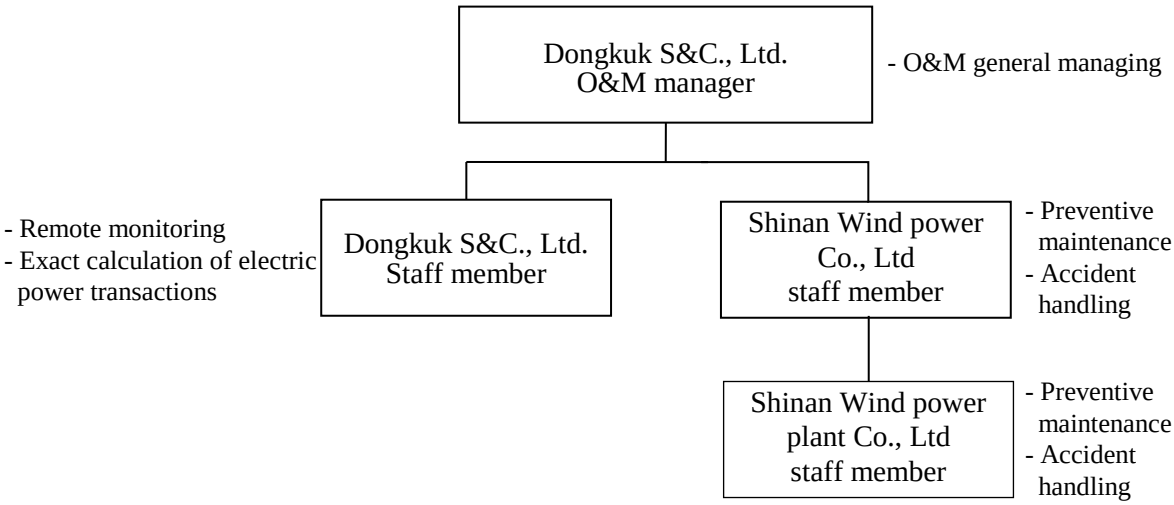
a. Measurement of electricity meters' data installed on the site.

b. The transmission of the data to the central server and KPX.
c. Aggregation of measured data.
d. Recording of measured data.
e. Calculation of Emission Reduction.
f. Reporting of Emission Reduction.



- The operational and management structure

Shinan wind power Co., Ltd which is the project participant is a subsidiary of Dongkuk S&C Co., Ltd. Therefore, Shinan Wind power plant Co., Ltd. is in charge of monitoring the data and reports it to Dongkuk S&C., LTD energy·construction team. Ecoeye co., Ltd is responsible for preparation of Monitoring Report, emission factor and submits it to Dongkuk S&C., Ltd. energy construction team. Below is the operational and management structure of CDM monitoring



- Quality control (QC) and Quality assurance (QA) procedures

1. Monitoring equipment

1-1. Electricity measuring meters was set up transparently in accordance with "Law regarding measurement" and "Act on operation of electricity market" and was sealed after affirmation of Korea Power Exchange.
1-2. Meters was approved through the certified official process (the valid period for the authorized certification: 7 years.)
1-3. Meters shall be calibrated when they are installed, and re-calibrated every three years after installation regularly.

2. Measure & Archive

2-1. Amount of electricity that has transmitted to the grid was measured automatically by established meters. The measured data are simultaneously transferred to Wind Power Plant and Korea Power Exchange.
2-2. Amount of electricity that has measured was collected daily, weekly, and monthly and shall be archived in electronic way.
2-3. The collected data in article 2-2. was compared with those of Korea power Exchange.
2-4. If two data compared in article 2-3. is different, the operation condition of electricity meters and other equipments was examined. In case meters are improperly operated, internal audits and correction procedure was implemented and be certified by the final decision-maker and Korea Power exchange.

3. Management of monitoring and electricity safety
3-1. Person in charge of monitoring and electricity safety shall attend the following courses once every three years.
- Course on Electricity safety
The course on 'Act on operation of electricity market' shall be attended once in case of replacing the person in charge of monitoring and electricity safety.
3-2. In case of absence of the responsible person, the second responsible person shall be selected.
3-3. If responsibility for monitoring and electricity safety is transferred to another person, it need to have approval by the final decision-maker.

SECTION D. Data and parameters

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

Data/Parameter	**EFy**
Unit	**tCO_2/MWh**
Description	CO_2 emission intensity of the electricity displaced
Source of data	The registered PDD
Value(s) applied	0.6096 tCO_2/MWh
Purpose of data	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comment	The same value will be applied during the first crediting period without updating.

D.2. Data and parameters monitored

Data/Parameter	EGy
Unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Measured/Calculated /Default	Calculated
Source of data	Measured by the watt-hour meter
Value(s) of monitored parameter	Total values in this monitoring period: 13,425.214 For the detail value in this monitoring period, refer to the ER spreadsheet.
Monitoring equipment	Electricity measuring watt-hour meter - Exported electricity meter 1.Type: AC3P4W 2. Accuracy: ±0.5% 3. Serial number : 51001390 4. Calibration information - Number of meter : 1 meter - Calibration frequency : within 3years - Date of initial/previous calibration : 25/11/2008 - Date of latest calibration : 04/10/2011 - Validity period : 04/10/2011~03/10/2014 - Imported electricity meter 1.Type: AC3P4W 2. Accuracy: ±1.0% 3. Serial number: 0083693 4. Calibration information - Number of meter : 1 meter - Calibration frequency : within three years - Date of initial/previous calibration: 17/12/2008 - Date of latest calibration : 01/12/2011 - Validity period : 01/12/2011 ~ 30/11/2014

Measuring/Reading/ Recording frequency	Exported electricity meter - Measuring frequency : real time - Reading frequency : hourly - Recording frequency : daily Imported electricity meter - Measuring frequency : real time - Reading frequency : daily - Recording frequency : monthly
Calculation method (if applicable)	N/A
QA/QC procedures	- Uncertainty of data is low - QA/QC procedure for this is planned - The allowable error of data must be within ±0.5%. - Regarding the imported electricity meter, its allowable error must be within ± 1.0%.
Purpose of data	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comment	The net value is the value of the difference between the incoming power and outgoing power

D.3. Implementation of sampling plan

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Not applicable

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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According to the registered PDD in accordance with AMS-I.D (version 13), the Baseline emissions (BEy) during the monitoring period is calculated as follows:

$BE_y = EG_y * EF_y$

Where:
BE_y: Baseline emissions (tCO_2)
EG_y: Electricity amounts supplied to the grid by the project (MWh)
EF_y: Baseline emission factor (tCO_2/MWh)

- $EG_{y,net}$ – Net electricity amounts supplied to the grid by the project.

Period	Electricity			Remarks
	EG_{yout}	**EG_{yin}**	**EGy**	
18/04/2010 ~ 17/04/2012	13,976.211	548.256	13,427.955	

However, EGyin value was applied to addition factor for conservative approach since the installed imported meter was less accurate than the meter described in the PDD. Therefore, the difference of accuracy level between the installed meter and the registered monitoring plan was added to EGyin based on CDM project standard appendix 1, paragraph 4 (b). Detail calculation is in the ER calculation spreadsheet (ver. 01.2). Below is adjusted value of above parameters.

Period	Electricity			Remarks
	EG_{yout}	**EG_{yin}**	**EGy**	

18/04/2010 ~ 17/04/2012	13,976.211	550.997	13,425.214	

- EF_y : Baseline emission factor.
The Baseline emission factor is calculated ex-ante 0.6096 tCO_2/MWh in the registered PDD and will be fixed during the first crediting period.

- BE_y : Baseline emissions
The baseline emission BEy (tCO2e) during this monitoring period is calculated as followings;

$BE_y = EG_y * EF_y$
$= 13,425.214MWh * 0.6096\ tCO_2/MWh$
$= 8,184.01\ tCO_2$
$\fallingdotseq 8,184\ tCO_2$

Thus, emission reduction generated in this monitoring period is 8,184 tCO_2

E.2. Calculation of project emissions or actual net GHG removals by sinks
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Following the registered PDD in accordance with AMS-I.D (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,
$PE_y = 0\ tCO_2$

E.3. Calculation of leakage
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Following the registered PDD in accordance with AMS-I.D (version 13), leakage does not need to be considered. Thus,

$LE_y = 0\ tCO_2$

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_2e)	Project emissions or actual net GHG removals by sinks (tCO_{2e})	Leakage (tCO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO_2e)
Total	8,184	0	0	8,184

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 (tCO_2e)	7,802	8,184

E.6. Remarks on difference from estimated value in registered PDD
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The first monitoring period is 24 months and the estimated reduction amounts are 7,802tCO_2. This value is 4.89% more than actual achieved values during this monitoring period 8,184 tCO_2 because of substantial variation of wind power. Hence the emission reduction during this monitoring period is deemed reasonable.

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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		