



**Verification and certification report form for
CDM project activities
(Version 02.1)**

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION

Title and UNFCCC reference number of the project activity	Taegisan Wind Power Project (Ref. 2302)
Version number of the verification and certification report	2.0
Completion date of the verification and certification report	12/03/2018
Monitoring period number and duration of this monitoring period	Monitoring period number : 5 th Monitoring duration : 01/01/2017 ~ 31/12/2017
Version number of the monitoring report to which this report applies	2.0
Crediting period of the project activity corresponding to this monitoring period	15/05/2009 ~ 14/05/2019
Project participants	- POSCO Engineering and Construction Co., Ltd. - Eurus Energy Holdings Corporation
Host Party	- Republic of Korea(host) - Japan (Annex I country)
Applied methodologies and standardized baselines	Methodology : ACM0002 (Version 07) Selected standardized baseline : N/A
Mandatory sectoral scopes linked to the applied methodologies	Sectoral scopes : I Energy Industries (Renewable / Non-renewable sources)
Conditional sectoral scope(s) linked to the applied methodologies	NA
Estimated amount of GHG emission reductions or GHG removals for this monitoring duration in the registered PDD	59,669tCO ₂ e
Certified amount of GHG emission reductions or GHG removals for this monitoring period	50,056 tCO ₂ e
Name and UNFCCC reference number of the DOE	KTR (Korea Testing and Research Institute)
Name, position and signature of the approver of the verification and certification report	Director CHO, Seonghun <i>CHO SEONGHUN</i>

SECTION A. Executive summary

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Eurus Energy Holdings Corporation has commissioned Korea Testing and Research Institute (hereinafter referred to as “KTR”) to carry out the 5th verification of the project titled “Taegisan Wind Power Project”.

The verification team from KTR has reviewed the implementation of the monitoring plan (MP) of the registered PDD (ver.05.0)^{/01/}. The Green House Gas (GHG) data for the monitoring period covering from 01/01/2017 to 31/12/2017 has been verified in detailed manner by applying the set of requirements, audit practices and principles as required under CDM Validation and Verification Standard for project activities (ver.01.0)^{/07/} of the United Nations Framework Convention for Climate Change (UNFCCC).

This report summarizes the findings and conclusions of this 5th verification of the UNFCCC registered project activity mentioned above.

The objectives of the verification are the review and ex-post determination of the GHG emission reductions by an independent entity. The objectives include the verification of:

- Implementation and operation of the project activity as given in the PDD^{/01/},
- Compliance with applied approved methodology and the provisions of the registered the MP,
- Data given in the monitoring report (ver.02.0)^{/09/} by checking the monitoring records, the emissions reduction calculation and supporting evidence,
- Accuracy of the monitoring equipment,
- Quality of evidence, and
- Significance of reporting risks and risks of material misstatements.

The verification of this registered project is based on the validated project design document, the revised MR (ver.02.0)^{/09/}, emission reduction calculation spreadsheet (ver.02.0)^{/11/}, supporting documents made available to the verifier and information collected through interviews and during the on-site assessment. Furthermore, publicly available information was considered as far as available and required.

The verification was carried out on the basis of the following requirements, applicable for this project activity:

- Article 12 of the Kyoto Protocol,
- Guidelines for the implementation of Article 12 of the Kyoto Protocol as presented in the Marrakech Accords under decision 3/CMP.1, and subsequent decisions made by the Executive Board and COP/MOP,
- Other relevant rules, including the host country legislation,
- CDM Validation and Verification Standard for project activities (ver.01.0)^{/07/},
- The Monitoring plan, and
- Approved CDM Methodology^{/06/}.

The following parties to the Kyoto Protocol and project participants (PP) are involved in this project (Table A-1).

Table A-1: Project parties and project participants

Characteristic	Party	Project Participant
Host party	Republic of Korea	POSOCO Engineering and Construction Co., Ltd..
Annex I party	Japan	Eurus Energy Holdings Corporation

The details of the project location are given in table A-2. The location has been confirmed by the verification team visually and by using GPS during the on-site visit.

Table A-2: Project Location

Parameter	Project Location
Host Country	Republic of Korea
Region	Gangwon-do
Project Location address	Taegi-ri, Dunnae-myun, Hoengseong-gun and Mui-ri, Bongpyeong-myun, Pyeongchang-gun
Latitude of Power Plant	EAST 37°32'
Longitude of Power Plant	NORTH 128°20'

The verification team has checked essential events of the project occurred since the registration of the project on the UNFCCC website, <http://cdm.unfccc.int/Projects/DB/KFQ1226904451.62/view>, and presented them in the following Table A-3.

Table A-3: Project verification history

No.	Item	Date	Status
1	Registration Date	15/05/2009	-
2	Start of crediting period	15/05/2009-	-
3	1 st Monitoring period	15/05/2009 – 31/05/2010	CER issued
4	2 nd Monitoring period	01/06/2010 – 31/05/2011	CER issued
5	3 rd Monitoring period	01/06/2011 – 30/09/2012	CER issued
6	4 th Monitoring period	01/10/2012 – 31/12/2016	MR publication

The purpose of this project is to generate electricity using wind power at south western area in Korea. The Taegisan Wind Park consists of 20 units of 2-MW wind turbines. The turbine model is VESTAS V80-2.0MW, a widely used around the world for large scale wind power generation projects. The VESTAS V80-2.0MW is a pitch regulated upwind turbine with active yaw and a rotor with three blades.

The proposed project was registered as a CDM project activity on 15/05/2009 with a crediting period of fixed 10 years from 15/05/2009 ~ 14/05/2019.

The verification team verified the key parameters for the project by physically checking the nameplates of wind generators along with their specification^{37/} and other installed equipment during the on-site assessment. The verification team's findings are summarized in the Table A-4.

Table A-4: Specification of the Wind Turbines and Generators

Rotor	
Diameter (m)	80
Sweptarea (m2)	5027
Rotational speed static, rotor (RPM)	16.7
Rotational speed operation interval rotor (RPM)	9.0 – 19.0
Rotational direction	Clockwise(front view)
Orientation	Upwind
Tilt (°)	6
Blade coning (°)	2
Number of blades	3
Aerodynamic brakes	Full feathering
Tip angle	Pitch regulated
Turbulence (%)	10

Specification Vestas V80-2MW wind turbine		
Design Wind Speed (10 min. average)	Start up Wind Speed (m/s)	4
	Normal Wind Speed (m/s)	15
	Stop Wind Speed (m/s)	25
Generator	Nominal output	2000kW
	Operation data	50 / 60 Hz 690V
Weight	Nacelle	67 t
	Rotor	37 t

Total installed capacity of the project is 40MW (2MW x 20). And the project is composed of 20 units of 2MW generators (wind power turbines).

These 20 units are classified in two different ways: (1) by the administrative district located and (1) by the measuring scheme for the electricity supplied to the grid.

In terms of administrative district, the project site is located between Hoengseong-gun and Pyeongchang-gun in Gangwon Province: Nine units in Hoengseon-gun and eleven units in Pyeongchang-gun.

- Hoengseong-gun, Gangwon-do: 2MW × 9 units (unit number 5,6,8,9,11~15) = 18 MW
- Pyeongchang-gun, Gangwon-do: 2MW × 11 units (unit number 1~4,7,10,16~20) = 22 MW

Depending on the way how the electricity supplied to the grid is measured, these units are divided into two 20MW groups consisting of 10 units each, i.e. electricity is supplied to the grid through two 20MW lines. One group consists of subgroup A and B, and the other group consists of subgroup C and D. Subgrouping of the units are as follows:

A: unit number14~20

B: unit number 5~7

C: unit number 8~13

D: unit number1~4

The verification team confirmed that the project was implemented as planned and described in the registered PDD^{/01/} and that the project activities are in accordance with the approved methodologyACM0002 (Version 07)^{/06/}. The verification team also confirmed that the installed equipment essential for emission reduction runs reliably and has been calibrated appropriately.

The sequence of the 5th verification of this monitoring period (01/01/2017~ 31/12/2017) is given in the Table A-5 below:

Table A-5: Verification sequence

Topic	Date
Assignment of verification	12/01/2018
Uploading of MR	17/01/2018
On-site inspection	08/02/2018
Draft reporting finalized	08/03/2018
Pre-technical review finalized	09/03/2018
Final reporting finalized	12/03/2018
Technical review finalized	14/03/2018
Final Approval of the verification	14/03/2018

The verification team confirmed that the monitoring was performed in accordance with the registered PDD^{/01/} and that the GHG emission reductions were calculated without any significant misstatements. The GHG emission reductions were verified by checking the registered PDD^{/01/}, the MR (ver.1)^{/08/} and MR (ver.2)^{/09/}, the relevant requirements and its relevant documents.

SECTION B. Verification team, technical reviewer and approver**B.1. Verification team member**

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interviews	Verification findings
1.	Team Leader	IR	LEE	Bongjae	KTR	X	X	X	X
2.	Verifier	EI	SHIN	Woochul	KTR	X	X	X	X
3.	Trainee	IR	Noh	Seolji	KTR	X	-	-	X

B.2. Technical reviewer and approver of the verification and certification report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	IR	KIM	Kihong	KTR
2.	Approver	IR	CHO	Seonghun	KTR

SECTION C. Application of materiality**C.1. Consideration of materiality in planning the verification**

No.	Risk that could lead to material errors, omissions or misstatements	Assessment of the risk		Response to the risk in the verification plan and/or sampling plan
		Risk level	Justification	
1.	Errors, omissions or misstatements of emission sources	Low	According to the applied methodology, the registered PDD and MR defined main emission sources of CO _{2e} which are the net electricity exported to the grid for the baseline. The error, omission or misstatements of emission source were not found during ahead of verification.	To be further confirmed by cross checking related documents and through on-site inspection.
2	Error, double counting, omission or misstatements of monitoring parameters.	Medium	Two parameters are defined in the revised PDD. The quantity of electricity exported to the grid (EG _{output,y}) and the quantity of electricity imported from the grid (EG _{import,y}) are measured continuously. No error, omission or misstatements of emission source were found during the verification.	To be further confirmed by cross checking related documents and through on-site inspection.
3	Accuracy of monitoring instruments	Low	The MR described the accuracy as 0.5% for the meters and sub-meters measuring	To be further confirmed by cross checking related documents and through on-site inspection.

			exported/imported electricity in accordance with the registered PDD.	
4	The delay of the calibration for some measuring instruments	Low	The MR included the calibration date and the validity information based on the monitoring plan in the registered PDD.	To be further confirmed by cross checking related documents and through on-site inspection.
5	IT system and data collection procedure for monitoring system	Low	The designated staffs record the collected data and calculate the emission reductions based on the MR, the monitoring manual and the data records. Automatic data collection system is mainly used and some data are manually recorded.	To be further confirmed by cross checking related documents and through on-site inspection.
6	Organization and QA/QC system	Low	Roles and responsibilities were defined according to the registered PDD. Monitoring activities including the data collection procedure, training, etc. were defined in the MR according to the registered PDD.	To be further confirmed by cross checking related documents and through on-site inspection.

C.2. Consideration of materiality in conducting the verification

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This project is a large-scale CDM project activity, achieving total emission reductions less than 300,000 tons of CO₂e per year; as such, a 2.0 percent materiality threshold is applied during this monitoring period as follows:

$$59,669 \text{ tCO}_2\text{e} \times 2\% = 1,193 \text{ tCO}_2\text{e} \text{ (Round down)}$$

Risks of potential errors have been identified and assessed for each typical element of the project environment as follow:

- Emission sources; Low risk, but need to checked during on-site inspection.
- Monitoring parameters; Medium, therefore, need to be cross-checked and confirmed for their completeness, consistency and transparency in the MR, the previous MR and other related documents during the on-site inspection.
- Monitoring instruments; Low risk, therefore, need to be cross-checked and confirmed through review of calibration records, the MR, and other related documents, the interview and physical observation during the on-site inspection.
- Data management system; Low risk, but need to be checked during the on-site inspection.
- Organization and QA system; Low risk, but the implementation status of the CDM monitoring system needs to be verified.

Outcomes of verification activities including the on-site inspection for each typical elements of the project environment are described below:

- Emission sources; Immaterial
No error, omission or misstatement in the boundary has been detected in the MR and the related data records.

During the on-site assessment, the verification team reviewed the TWPC's internal report on the electricity generated and interviewed the staff in charge of the facility's operation and management. No missing data was found.

- Monitoring parameters; Immaterial

The verification team cross-checked the all parameters related to the emission reduction against the measured data archived in internal database system^{/13//15/} and sales records provided by KPX^{/14/}, Electricity bill provided by KEPCO^{/16/} and found them consistent.

In conclusion, the calibration records, actual sets of the monitoring meters and the measured/ calculated data were identified as immaterial.

- Monitoring instruments; Immaterial

The verification team confirms that the accuracies of meters for export and import electricity are 0.5% in accordance with the national law 'Rules on the Operation of Electric Utility Market'^{/20/} and the Monitoring Plan of the registered PDD^{/01/}.

The registered PDD and the MR state that the frequency of calibration is every 3 years ± 6 month for exported and imported electricity meters in accordance with 'Rules on the Operation of Electric utility Market'^{/20/} and Article 2.1 of national law 'Enforcement Decree of the Measures Act'^{/21/}.

The verification team confirms that the accuracies and the calibration frequency of monitoring instruments are in compliance with the registered PDD and the applicable national laws.

- Data management system: Immaterial

The entire data on electricity generation and electricity consumption are automatically gathered and transferred to the internal database system at the site office.

These data stored in the server are manually transferred to the spreadsheet.

All assumptions and references to original data sources are well documented in the MR.

Only designated staffs record the collected data and calculate the emission reductions based on the MR and the related data records. After verifying all the data for this monitoring period, the verification team confirmed no material error.

- Organization and QA/QC system; immaterial

Roles/responsibilities and actual implementation of QA/QC system were verified and no major outstanding issue in materiality was identified.

As mentioned above, the verification team conducted the verification for the 5th monitoring period with a 2 percent materiality threshold.

If an omission, misstatement, or erroneous reporting of information at an aggregated level leads to an overestimation of the total emission reductions achieved by a registered CDM project activity equal to or higher than a 2 percent threshold, the verification team would revise the overall verification plans and sampling plans after performing additional risk assessment for approval of the quality of the verification. However, the verification team conducted no more assessment since the difference between reported GHG emission reductions and the verified GHG emission reductions was below 2 percent threshold.

SECTION D. Means of verification

D.1. Desk/document review

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During the desk review, all documents initially provided by the project participant and publicly available were reviewed by following the KTR internal Quality procedures. The main documents reviewed are listed below:

- The Final version of the PDD^{/01/} including the MP;
- The Final version of the validation report^{/02/},

- The 1st, 2nd, 3rd verification report^{/03//04//05/},
- Approved methodology ACM0002 (Version 07)^{/06/};
- The MR (ver.1, 2), including the claimed emission reductions for the project^{/08//09/}, and
- ER calculation sheet (ver.1, 2)^{/10//11/}.

Other supporting documents, such as publicly available information from the UNFCCC website and background information were also reviewed.

D.2. On-site inspection

Duration of on-site inspection: 08/02/2018				
No.	Activity performed on-site	Site location	Date	Team member
1.	Implementation and Operation of the CDM project activity based on registered Monitoring Plan and physical features of the project activity as per the revised PDD	Gangwon-Do, Republic of Korea	08/02/2018	LEE Bong Jae SHIN Woo Chul
2.	Information flows generating, aggregating and reporting the monitoring parameters			
3.	Competency of operational personnel, monitoring personnel and calibrating agencies			
4.	Data collection procedures			
5.	Calibration performance and monitoring practices followed for monitoring equipment's used in the project activity			
6.	Quality Control and Quality Assurance procedures against the approved monitoring plan			
7.	Calibration and assumptions made in determining the GHG data and emission reduction			
8.	Compliance with CDM criterion and relevant guidance with respect to MP			
9.	Level of accuracy (Materiality) of the monitoring activity			

D.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Oh	Jinseon	TWPC	08/02/2018	<ul style="list-style-type: none"> - Involved personnel and responsibilities - Records of metering equipment - Training and practice of the operational personnel - Implementation of the MP - Monitoring data management - Data collection procedures 	LEE Bong Jae SHIN Woo Chul
	Lee Lim	Taehee Hyunoh	TWPC	08/02/2018	<ul style="list-style-type: none"> - Technical equipment and their operation - Monitoring and measuring instruments - Calibration 	

					procedures - Maintenance of Facility	
	Park	Jungkyu	Eurus Energy Korea corporation	08/02/2018	- General aspects of the project - Quality management system	
	Jung	Dajeong	Ecoeye	08/02/2018	- GHG calculation - Report for ER	

D.4. Sampling approach

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No sampling approach was taken during the verification because this project is located in only one site.

The verification team verified and cross-checked all of the data used in the GHG emission reduction calculations against the raw data measured by the PP and the recorded data in the internal management system.

D.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) raised

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
Compliance of the monitoring report with the monitoring report form	0	1	0
Compliance of the project implementation and operation with the registered PDD	0	2	0
Post-registration changes	0	0	0
Compliance of the registered monitoring plan with the methodologies including applicable tools and standardized baselines	0	0	0
Compliance of monitoring activities with the registered monitoring plan	0	0	0
Compliance with the calibration frequency requirements for measuring instruments	0	1	0
Assessment of data and calculation of emission reductions or net removals	0	1	0
Assessment of reported sustainable development co-benefits	0	0	0
Global stakeholder consultation	0	0	0
Others (please specify)	0	0	0
Total	0	5	0

SECTION E. Verification findings

E.1. Compliance of the monitoring report with the monitoring report form

Means of verification	During the document Review, the verification team has determined whether the monitoring report was completed using the valid version of the applicable monitoring report form. The verification team has checked whether all the sections of the monitoring report follows the guidelines provided in the template itself.
Findings	There is 1 CAR raised in this section.
Conclusion	The PP has used the version 6.0 of the MR template ^{/12/} which is current and effective. The monitoring report has been prepared as per the instructions provided in the template. The verification team has concluded that the monitoring report was completed using the valid version of the applicable monitoring report form and followed the guidelines given in the template itself.

	<p>The verification team noticed that Annex 1,2, and 3 referenced in the main text of the MR are missing in the MR (ver.1)^{/08/} and request the PP to include the Annexes. Therefore, the CAR 1 was raised.</p> <p>The PP provided the verification team with Annex 1 Drawing showing the monitoring points^{/13/}, Annex 2 Electricity transmission line map^{/15/}, and Annex 3 Resistance calculation data^{/15/}.</p> <p>The verification team reviewed the revised MR (ver.2)^{/09/} and confirmed that three missing Annexes was included in the revised MR (ver.2)^{/09/} and the data in the Annexes have been used correctly in the MR (ver.2)^{/09/} and the ER calculation sheet (ver.2)^{/11/}. Therefore, CAR 1 has been closed successfully.</p>
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E.2. Remaining forward action requests from validation and/or previous verifications

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The verification team confirmed that there are no remaining forward action requests from the previous verification.

E.3. Compliance of the project implementation and operation with the registered project design document

Means of verification	The verification team determined the conformity of the actual project activity and its operation with the registered PDD. KTR has, by means of a desk review and an on-site visit. The team confirmed that all physical features of the proposed CDM project activity in the registered PDD are in place, and that the PP has operated the CDM project activity as per the registered PDD.
Findings	There are 2 CARs raised in this section.
Conclusion	<p>The project activity has been implemented as per the registered PDD^{/01/} and information from the UNFCCC website.</p> <p>The project is a wind power generation by 20 turbines with 2 MW capacity each. The total capacity of 20 turbines is 40 MW. By reviewing the documents concerning the completion of facility construction and through the site visit, the verification team confirmed that all required facilities were installed and being operated as described in the registered PDD^{/01/}. They were installed as described below during the period from 25/07/2007 (construction start date) to 26/12/2008 (commissioning date) as follows:</p> <ul style="list-style-type: none"> - Wind Turbine (V80) manufacturer: VESTAS Wind System (Denmark) - Plant design: Hyundai Engineering CO., Ltd. (Korea) - Installation work: POSCO Engineering and Construction Co., Ltd. (Korea) <p>The verification team confirmed that the construction start date is 25/07/2007 based on the document^{/16/} by POSCO and the approval from^{/17/} The Ministry of Commerce as the planned date 01/05/2007 was described in PDD and the commercial operation start date was 28/01/2009 based on the report^{/18/} to the Ministry of Knowledge Economy.</p> <p>The verification team also confirmed that the 20 wind turbine generators are divided into two groups having 10 turbine generators each. Each groups consisting of 2 subgroups share one 20MW transmission lines to the central control panel of the site.</p> <p>And also the watt-hour meters for export and import electricity, SCADA (Supervisory Control And Data Acquisition) system and 2 transmission lines (22.9 kV 33km) were installed and being operated.</p> <p>However, the verification noticed that there were some operational events for troubleshooting and overhauling during the monitoring period and requested the details on the events (CAR 2).</p> <p>The PP provided the verification team with the records on the operational events occurred during the monitoring period and added the details to the MR (ver.2)^{/09/}.</p> <p>The verification team reviewed the operation log^{/21/} and the raw data^{/22/} on the quantity of generated electricity to find that the quantity was recorded as 0 at the time of troubleshooting or overhaul and confirmed that these operational events occurred during the monitoring period were properly reflected in the revised MR (ver.2)^{/09/}. Therefore, CAR 2 has been closed.</p> <p>The verification team also noticed that monitoring and internal audit are performed by the same person according to the MR (ver.1)^{/08/} and the organization chart in the</p>

	CDM manual (1.4) ^{/23/} . The team requested the PP to change the system in order to safeguard the impartiality of the operation (CAR 3). The PP segregated the internal auditor and the monitoring manager and reflected this in the MR (ver.2) ^{/09/} and the organization chart in the CDM manual (ver.1.5) ^{/24/} accordingly. The verification team reviewed the revised MR (ver.2) ^{/09/} and the revised CDM manual (ver.1.5) ^{/24/} to confirm the changes. With these changes, the internal audit shall be performed in an appropriate way by the vice president who is not involved in monitoring activities. Therefore, CAR 3 has been closed.
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E.4. Post-registration changes

E.4.1. Temporary deviations from the registered monitoring plan, applied methodologies or applied standardized baselines

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The verification team confirms that there is no temporary deviation during this monitoring period.

E.4.2. Corrections

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The verification team confirms that there is no corrections to the registered project.

E.4.3. Change to the start date of the crediting period of the project activity

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The verification team confirms that there is no change to the start date of the crediting period.

E.4.4. Inclusion of a monitoring plan

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The verification team confirms that there is no monitoring plan to be included in the registered project activity.

E.4.5. Permanent changes from registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines or other applied standards or tools

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The verification team confirmed that the revised MP was approved on 30 Mar 2011.

E.4.6. Changes to the project design

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The verification team confirms that there is no change to the project design of the registered project activity.

E.4.7. Changes specific to afforestation and reforestation project activities

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N/A

E.5. Compliance of the registered monitoring plan with the methodology including applicable tools and standardized baselines

Means of verification	During document review, the verification team determined whether the registered monitoring plan is in accordance with the applied methodology(ACM0002) including applicable tools.
Findings	There is no CAR/CL raised in this section.
Conclusion	The verification team confirmed that the project and the monitoring system has been implemented in accordance with the provisions of the registered PDD (ver.05.0) ^{/01/} and the applied monitoring methodology (ACM0002 Version 07) ^{/06/} and that this project has no monitoring aspect not specified in the methodology.

E.6. Compliance of monitoring activities with the registered monitoring plan**E.6.1. Data and parameters fixed ex ante or at renewal of crediting period**

Means of verification	The verification team has determined whether the registered monitoring plan has been properly implemented and followed by the PP. The verification team also determined whether all data and parameters specified in the monitoring plan as fixed ex ante values including project emission parameters, baseline emission parameters and leakage parameters for emission reduction calculation have been used appropriately as stated in the revised PDD.												
Findings	There is no CAR/CL raised in this section.												
Conclusion	The PP has applied data and parameters fixed ex ante for monitoring and calculating the GHG emission reductions as follow.												
	Table E.6.1-1 Information of data and parameter fixed ex-ante												
	<table><tr><th>Data/parameter</th><th>Applied value</th><th>Source of data</th></tr><tr><td>OM Emission Factor of Grid, $EF_{grid,OM,y}$</td><td>0.7281 tCO2/MWh</td><td>$EF_{grid,OM,y}$ was calculated based on the ACM0002 (ver.7.0)^{/06/}. Required values for the calculation were taken from the Statistics of Electric Power^{/25/} provided by the Korea Electric Power Corporation.</td></tr><tr><td>BM Emission Factor of Grid, $EF_{grid,BM,y}$</td><td>0.3859 tCO2/MWh</td><td>$EF_{grid,BM,y}$ was calculated based on the ACM0002(ver.7.0)^{/06/}. Required values for the calculation were taken from the Statistics of Electric Power^{/25/} provided by the Korea Electric Power Corporation</td></tr><tr><td>Combined Emission Factor of Grid, $EF_{grid,CM,y}$</td><td>0.6426 tCO2/MWh</td><td>$EF_{grid,CM,y}$ was calculated based on the ACM0002(ver.7.0)^{/06/}. Required values for the calculation were taken from the Statistics of Electric Power^{/25/} provided by the Korea Electric Power Corporation</td></tr></table>	Data/parameter	Applied value	Source of data	OM Emission Factor of Grid, $EF_{grid,OM,y}$	0.7281 tCO2/MWh	$EF_{grid,OM,y}$ was calculated based on the ACM0002 (ver.7.0) ^{/06/} . Required values for the calculation were taken from the Statistics of Electric Power ^{/25/} provided by the Korea Electric Power Corporation.	BM Emission Factor of Grid, $EF_{grid,BM,y}$	0.3859 tCO2/MWh	$EF_{grid,BM,y}$ was calculated based on the ACM0002(ver.7.0) ^{/06/} . Required values for the calculation were taken from the Statistics of Electric Power ^{/25/} provided by the Korea Electric Power Corporation	Combined Emission Factor of Grid, $EF_{grid,CM,y}$	0.6426 tCO2/MWh	$EF_{grid,CM,y}$ was calculated based on the ACM0002(ver.7.0) ^{/06/} . Required values for the calculation were taken from the Statistics of Electric Power ^{/25/} provided by the Korea Electric Power Corporation
	Data/parameter	Applied value	Source of data										
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Combined Emission Factor of Grid, $EF_{grid,CM,y}$	0.6426 tCO2/MWh	$EF_{grid,CM,y}$ was calculated based on the ACM0002(ver.7.0) ^{/06/} . Required values for the calculation were taken from the Statistics of Electric Power ^{/25/} provided by the Korea Electric Power Corporation											
	The verification team confirmed that the PP has applied all of data and parameter fixed ante adequately in calculating the GHG emission reductions according to the registered and validated PDD ^{/01/} .												

E.6.2. Data and parameters monitored

Means of verification	The verification team has determined whether the registered monitoring plan has been properly implemented and followed by the PP. The verification team also determined whether all parameters specified in the registered monitoring plan including project emission parameters, baseline emission parameters and leakage parameters for emission reduction calculation have been monitored or used appropriately as stated in the registered PDD.
Findings	There is no CAR/CL raised in this section.
Conclusion	<p>According to the MP of the registered PDD (ver. 5.0)^{/01/} and monitoring methodology for which ACM0002 (ver. 7.0)^{/06/} has been applied, the monitoring parameters is the net electricity generated by this project.</p> <p>During the verification, this monitoring parameter has been verified with regard to the appropriateness of the applied measurement and determination method, the correctness of the values used in the ER calculation, the accuracy and applied QA/QC measures.</p> <p><u>Electricity supplied</u> Twenty wind turbine generators are grouped into 2 banks. Each bank has 2 electric meters measuring exported electricity installed at the electric room of the wind power plant. In total, 2 main and 2 sub meters have been installed for measurement of exported</p>

electricity in the plant according to the registered PDD (ver.05)^{/01/}.

If the main meters do not function properly, the sub meters will replace the main meters.

The parameter $EG_{\text{output},y}$ is obtained from the data from these four watt-hour meters.

The quantity of electricity supplied to the grid is automatically and continuously measured and recorded daily by the meters in the electrical room at the plant site.

The measured data are transferred to the internal database managed by the Business Administration team of TWPC.

The verification team cross-checked the values stored in the internal database of PP^{/26/} against the data in the sales records provided by KPX^{/27/} and found them consistent.

The verified quantity of supplied electricity is 84,398.365MWh for this monitoring period.

Electricity Imported

As discussed in $EG_{\text{output},y}$, 20 wind turbine generators are grouped into 2 banks. Each bank has one electric meter measuring imported electricity installed at the electric room of the wind power plant, i.e. two electric meters are installed at the project site for imported electricity.

The parameter $EG_{\text{import},y}$ is obtained from the data from these two watt- hour meters

The quantity of electricity imported from the grid (#1, #2) is measured continuously and recorded monthly. The data is archived in the internal database managed by the Business Administration of TWPC.

The verification team cross-checked the values^{/26/} against the internal database of the PP and the data in the relevant electricity bill provided by KEPCO^{/28/} and found them consistent.

The verified quantity of imported electricity is 274.140MWh for this monitoring period.

Supplied/Imported Transmission Loss

The interface between the project and the grid is located at the Pyengchang 22.9kV substation which is owned by KEPCO, and located at approximately 33km west from the project site.

The watt-hour meters are installed at the Taegisan Wind Power Co., Ltd., not at the interface substation. Therefore, transmission loss between the project site and the substation needs to be considered for accurate determination of the net amount of electricity supplied to the grid.

The transmission losses for exported and imported electricity during this monitoring period were verified as 6,227.073 MWh and 0.086MWh, respectively.

Net electricity supplied to the grid

This parameter, EG_y is the quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity.

The verification team confirmed that the formula used in the ER calculation sheet^{/10/} is correct.

The net electricity delivered to the grid by the project activity (EG_y) is obtained by calculating (Electricity supplied – Electricity imported).

The net electricity delivered to the grid considering transmission loss (NE) is obtained by calculating (EG_y – Transmission Loss in the supplied electricity -

	Transmission Loss in the imported electricity).
	The reported and verified quantity of net electricity supplied to the grid by the project activity during this monitoring period is 77,897.066 MWh.

E.6.3. Implementation of sampling plan

Means of verification	The verification assessed whether the sampling efforts and surveys comply with the validated sampling plan in accordance with applicable verification requirements related to the compliance of monitoring activities with the monitoring plan in the registered PDD and the “Standard for sampling and surveys for CDM project activities and programme of activities”
Findings	There is no CAR/CL raised in this section.
Conclusion	The PP did not apply sampling approach to determine data and parameters monitored during this monitoring period. The verification team confirmed this by checking all the documents submitted.

E.7. Compliance with the calibration frequency requirements for measuring instruments

Means of verification	The verification team determined whether the calibration of the measuring equipment that has an impact on the claimed emission reductions is conducted by the PP at a frequency specified in the registered monitoring plan.																											
Findings	There is 1 CAR raised in this section.																											
Conclusion	<p>The verification team reviewed the information on the meters for imported and exported electricity in the MR (ver.1)^{/08/}, calibration/test reports^{/29/} and the applicable national law to confirmed that there was no calibration delay during the monitoring period. However, some information in the MR (ver.1)^{/08/} was not consistent with the verification team’s observation during the site visit. Therefore, CAR 4 was raised.</p> <p>The PP revised the MR (ver.2)^{/09/} based on the calibration reports and the test reports^{/29/} and the verification team confirmed that the corrections were properly made. Therefore, CAR 4 has been closed.</p> <p>The verification team verified the following items related to the meters measuring imported/exported electricity.</p> <p><u>EG_{output,y} (Electricity exported)</u></p> <p>According to the approved MP, calibrations should be performed in accordance with the applicable national laws. Calibrations of the meters for exported electricity were conducted in accordance with the ‘Rules on the operation of electric utility market’^{/30/} by KPX, which requires 3 years 6 months ± 6 months (3 years to 4 years) calibration interval for watt-hour meters with capacity larger than 1 MW.</p> <p>The verification team reviewed ‘Electric meter test reports’^{/31/} and found that the results meet the requirements given in the type approval standards^{/32/} stipulated by KATS.</p> <p>The verification team confirmed that calibration validity of meters were maintained throughout this monitoring period.</p> <p>The detailed information for each electricity meters is summarized below:</p> <table><tr><th></th><th>#1 Main meter</th><th>#1 Sub-meter</th></tr><tr><td>Type</td><td>Electric meter</td><td>Electric meter</td></tr><tr><td>Accuracy</td><td>0.5S.</td><td>0.5S.</td></tr><tr><td>Serial number</td><td>46026112</td><td>46026111</td></tr><tr><td>Calibration frequency</td><td>3 years 6month ±6 month</td><td>3 years 6month ±6 month</td></tr><tr><td>Date of installation</td><td>10/09/2008</td><td>10/09/2008</td></tr><tr><td>Date of previous calibration</td><td>21/08/2012</td><td>21/08/2012</td></tr><tr><td>Date of last calibration</td><td>10/07/2015</td><td>10/07/2015</td></tr><tr><td>Validity</td><td>10/07/2015 ~09/01/2019</td><td>10/07/2015 ~ 09/01/2019</td></tr></table>		#1 Main meter	#1 Sub-meter	Type	Electric meter	Electric meter	Accuracy	0.5S.	0.5S.	Serial number	46026112	46026111	Calibration frequency	3 years 6month ±6 month	3 years 6month ±6 month	Date of installation	10/09/2008	10/09/2008	Date of previous calibration	21/08/2012	21/08/2012	Date of last calibration	10/07/2015	10/07/2015	Validity	10/07/2015 ~09/01/2019	10/07/2015 ~ 09/01/2019
	#1 Main meter	#1 Sub-meter																										
Type	Electric meter	Electric meter																										
Accuracy	0.5S.	0.5S.																										
Serial number	46026112	46026111																										
Calibration frequency	3 years 6month ±6 month	3 years 6month ±6 month																										
Date of installation	10/09/2008	10/09/2008																										
Date of previous calibration	21/08/2012	21/08/2012																										
Date of last calibration	10/07/2015	10/07/2015																										
Validity	10/07/2015 ~09/01/2019	10/07/2015 ~ 09/01/2019																										

	#2 Main meter	#2 Sub-meter
Type	Electric meter	Electric meter
Accuracy	0.5S.	0.5S.
Serial number	46026114	46026113
Calibration frequency	3 years 6month ±6 month	3 years 6month ±6 month
Date of installation	10/09/2008	10/09/2008
Date of previous calibration	21/08/2012	21/08/2012
Date of last calibration	10/07/2015	10/07/2015
Validity	10/07/2015 ~ 09/01/2019	10/07/2015 ~ 09/01/2019

By reviewing the above rules and Electric meter test reports^{/31/} for exported electricity, the verification team confirmed that the calibration has been performed properly in accordance with the applicable national law.

EG_{import,y} (Electricity imported)

According to the approved MP, the calibration should be done in accordance with the national laws. The calibration of the KEPCO meter was conducted based on the Enforcement Decree of the Measures Act^{/33/}, which requires a calibration every 3~4 years.

The calibrations have been performed by the KTC, which is an accredited national calibration agency in Korea.

Therefore, the verification team confirms that the calibration frequency of watt-hour meters for imported electricity complies with the national law.

The detailed information for each electricity meters is summarized below:

	#1	#2
Type	Electric meter	Electric meter
Accuracy	0.5S.	0.5S.
Serial number	02112005008	02112004932
Calibration frequency	3years 6month ±6month	3years 6month ±6month
Date of installation	25/06/2012	25/06/2012
Date of previous calibration	21/10/2011	21/10/2011
Date of last calibration	21/11/2014	21/11/2014
Validity	21/11/2014~ 20/05/2018	21/11/2014~ 20/05/2018

By reviewing the above rules and calibration certificates of Electric meters^{/34/} for imported electricity, the verification team confirmed that the calibration has been performed properly in accordance with the applicable national law.

E.8. Assessment of data and calculation of emission reductions or net removals

E.8.1. Calculation of baseline GHG emissions or baseline net GHG removals by sinks

Means of verification	The verification team verified the data and calculations of GHG emission reductions achieved resulting from the registered CDM project activity. The verification team checked whether calculations of baseline GHG emissions, project GHG emissions and leakage GHG emissions have been carried out in accordance with the formulae and methods described in the registered MP.
Findings	There is 1 CAR raised in this section.
Conclusion	The verification team reviewed all the data related to GHG emission reduction calculation such as KPX data ^{/36/} , KEPCO data ^{/37/} , internal log ^{/26/} on electricity generation, and etc. to confirm that data used in the MR (ver.1) ^{/08/} and the ER calculation sheet (ver.1) ^{/10/} is consistent with the data in the reviewed documents. However, treatment of the number of significant digit in the ER calculation was not consistent. Therefore, CAR 5 was raised. PP revised ER calculation sheet (ver.2) ^{/11/} as follow; In case of exported electricity, when combining daily data to monthly data, the verification team converted the unit from Wh to kWh and calculated monthly data in integer units by rounding down the first decimal point.

In case of MWh loss for the transmission loss of imported electricity, the fourth decimal point was rounded up to the third decimal point for conservative calculation.

In case of emission reduction, BE_y was calculated as the third decimal point by rounding down the fourth decimal point.

The verification team determined that the PP's revised scheme for the number of significant digit in the ER calculation sheet (ver.2)^{/11/} is a conservative approach and acceptable. Therefore, CAR 5 has been closed.

The verification team verified the followings in relation to the ER calculation.

The formula used for the determination of baseline emissions is consistent with the registered PDD^{/01/}.

$$BE_y = EG_y * EF_y$$

Where:

EG_y is net electricity supplied by the project activity to the grid in year y, in MWh
 EF_y is baseline emission factor in year y, in tCO₂e/MWh according to the registered PDD^{/01/}

$$EG_y = EG_{\text{output},y} - EG_{\text{import},y}$$

Where;

EG_y -Net electricity supplied to the grid during the monitoring period (MWh);

$EG_{\text{output},y}$ -Electricity supplied to the grid (MWh);

$EG_{\text{import},y}$ - Electricity imported from the grid (MWh).

The KEPCO's 22.9kV substation between the project site and the grid is located at approximately 33km away from the project site in Pyengchang-gun. The watt-hour meters are installed at the Taegisan Wind Power Co., Ltd., not at the interface substation. Therefore, transmission loss between the project site and the substation needs to be considered for accurate determination of the amount of net electricity supplied to the grid,

$$LE_y = I^2 R_3 \times T$$

$$\text{kWh Loss} = (I_p / PF)^2 R_3 \times T$$

$$I = I_p / PF$$

$$I_p = P / (1.732 \times 22.9 \times T)$$

Where:

P : Electricity generation / import (measured)

T : Time (period) = 24x days

I : Current on the transmission line (A)

PF : Power Factor of electricity generation (97%)

R₁ : The phase resistance (ohm) 1 phase resistance

R₃ : The phase resistance (ohm) of 3 transmission lines $R_3 = 3 \times R_1$

22.9 : Voltage of power line from Teagisan Wind Park to the substation (kV)

Determination of amount of parameter;

EF_y : Baseline Emission Factor of Korea is calculated ex-ante and fixed during the crediting period.

The value is 0.6426tCO₂e/MWh;

R₁ : The Wire Resistance of transmission line is based on the transmission cable specifications by manufacturer, Daeil Wire Co., Ltd., Conmolink Co., Ltd. and Taihan Electric Wire Co., Ltd.^{/36/}.

1) Underground Transmission Line:

Cable Length: 8km (2 parallel lines)

Test Result of Resistance (per km): 0.07215

Total Resistance for underground T/L: $0.07215 \times 8 / 2 = 0.2886$

2) Overhead Transmission Line 1:

Cable Length: 22km

	<p>Test Result of Resistance (per km): 0.1183 Total Resistance for overhead T/L: $0.1183 \times 22 = 2.6026$ 3) Overhead Transmission Line 2: Cable Length: 3km Test Result of Resistance (per km): $0.183 \times 3 = 0.549$</p> <p>Thus, GHG emission reduction is calculated as below by considering transmission loss: $BE_y = EG_y \times EF_y$ $= [(EG_{output,y} - EG_{import,y}) - (TL_{y,supply} + TL_{y,import})] \times EF_y$</p> <p>$= [(84,398.365 - 274,140) - (6,227.073 + 0.086)] \times 0.6426$ $= 77,897.066 \text{ MWh} \times 0.6426 \text{ tCO}_2\text{e/MWh}$ $= 50,056.646 \text{ tCO}_2\text{e}$</p>
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E.8.2. Calculation of project GHG emissions or actual net anthropogenic GHG removals by sinks

Means of verification	The verification team verified whether the data and calculations of GHG emission reductions achieved resulting from the registered CDM project activity. The verification team checked whether calculations of baseline GHG emissions, project GHG emissions and leakage GHG emissions have been carried out in accordance with the formulae and methods described in the registered MP.
Findings	There is no CAR/CL raised in this section.
Conclusion	Project activity emission is considered as zero as per the methodology ACM0002 (ver.7.0) ^{/06/} and the registered PDD (ver.05.0) ^{/01/} , i.e. $PE_y = 0$.

E.8.3. Calculation of leakage GHG emissions

Means of verification	The verification team verified the data and calculations of GHG emission reductions achieved resulting from the registered CDM project activity. The verification team checked whether calculations of baseline GHG emissions, project GHG emissions and leakage GHG emissions have been carried out in accordance with the formulae and methods described in the registered MP.
Findings	There is no CAR/CL raised in this section.
Conclusion	In accordance with ACM0002(ver.7.0) ^{/06/} and the registered PDD (ver.05.0) ^{/01/} , the renewable energy project doesn't need to consider the leakage, i.e. $LE_y = 0$.

E.8.4. Summary calculation of GHG emission reductions or net anthropogenic GHG removals by sinks

Means of verification	The verification team verified the data and calculations of GHG emission reductions achieved resulting from the registered CDM project activity. The verification team checked whether calculations of baseline GHG emissions, project GHG emissions and leakage GHG emissions have been carried out in accordance with the formulae and methods described in the registered MP.
Findings	There is no CAR/CL raised in this section.
Conclusion	<p>The formula used for the determination of emission reductions during the monitoring period was consistent with the registered PDD (ver.06.0)^{/01/}.</p> <p>The detailed ER calculation is as follow:</p> <p>$BE_y = EG_y \times EF_y$ $= 77,897.08 \text{ MWh} \times 0.6426 \text{ tCO}_2\text{e/MWh}$ $= 50,056.646 \text{ tCO}_2\text{e}$</p> <p>$PE_y = 0 \text{ tCO}_2\text{e}$</p> <p>$LE_y = 0 \text{ tCO}_2\text{e}$</p> <p>$ER_y = BE_y - PE_y - LE_y$ $= 50,056 \text{ tCO}_2\text{e}$</p>

	As shown above, the emission reduction during the monitoring period (01/01/2017 - 31/12/2017) is 50,056 tCO ₂ e. After thoroughly checking the records ^{/35/} in the KPX database, the official document ^{/16/} on the electricity obtained from the KEPCO grid and internal database ^{/26/} of the PP, the verification team confirms that the calculation in the ER spreadsheet (ver.2) ^{/11/} is reproducible and accurate.
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E.8.5. Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Means of verification	The verification team determined the CER achieved during this monitoring period with the estimated value and reason for increase if any.
Findings	There is no CAR/CL raised in this section
Conclusion	The MR includes a comparison of the calculated actual emission reductions which is 50,056 tCO ₂ e with the ex-ante calculated values which is 59,669tCO ₂ e in the registered PDD (ver.05.0) ^{/01/} . The verification team confirmed that the actual GHG emission reductions and the estimates in the PDD are correctly stated in the MR by cross-checking the ER calculation sheet and the registered PDD ^{/01/} .

E.8.6. Remarks on difference from estimated value in registered PDD

Means of verification	The verification team determined the CER achieved during this monitoring period with the estimated value and reason for increase if any.
Findings	There is no CAR/CL raised in this section
Conclusion	In this monitoring period, the actual emission reduction is lower than the expected emission reduction as calculated in the PDD (ver.05.0). The electricity generation during this period is 83,398.365 MWh which is lower than the estimated electricity generation (92,856MWh/year). The actual electricity generation was 16.11% lower than the estimated electricity generation. The main reason for low electricity generation is due to the troubleshooting and overhaul of some wind turbines. The verification team reviewed the operation log ^{/21/} and the raw data ^{/22/} on the quantity of generated electricity to find that the quantity was recorded as 0 at the time of troubleshooting or overhaul.

E.8.7. Actual GHG emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Means of verification	The verification team determined the CER achieved during the first and second commitment period
Findings	There is no CAR/CL raised in this section
Conclusion	This monitoring period is from 01/01/2017 to 31/12/2017. Hence, the PP stated the total amount of GHG emission reductions of this monitoring period as GHG emission reductions from 01/01/2017 onwards in the MR. The verification team confirmed that this monitoring period is correct through the related evidence provided by the PP, and both the total amount GHG emission reductions and the GHG emission reduction of the period from 01/01/2017 onwards are stated appropriately in the MR.

E.9. Assessment of reported sustainable development co-benefits

Means of verification	N/A
Findings	N/A
Conclusion	N/A

E.10. Global stakeholder consultation

Means of verification	N/A
Findings	N/A
Conclusion	N/A

SECTION F. Internal quality control

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Quality Management procedures for measurements, collection and compilation of data, data storage and archiving, calibration, maintenance, and training of personnel in the framework of this CDM project activity have been defined in the approved MP. The procedures described in the MR are consistent with the MP and assessed as appropriate in the purpose. No significant deviation has been observed during the verification.

The whole procedure of quality management was verified by the verification team by interviewing the responsible personnel and by checking the CDM Monitoring Manual.

SECTION G. Verification opinion

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Eurus Energy Holdings Corporation has commissioned Korea Testing and Research Institute (KTR) to carry out the 5th periodic verification of the project: "Taegisan Wind Power Project (UNFCCC Ref.2302)", with regard to the relevant requirements for CDM project activities. The project reduces GHG emissions by replacing the electricity generated from fossil fuel fired power plants with the electricity generated from the wind power generation plant. This verification covers the period from 01/01/2017 to 31/12/2017 (including both days).

The verification was carried out based on the monitoring report (ver.1.0), the revised monitoring report (ver.02.0), the registered PDD (ver.05.0), the ER calculation sheet (ver.02.0), the validation report (ver.02.0), and other supporting documents made available to KTR by the PP. The verification included assessment of evidences relevant to the amounts related to the project's GHG emission reductions for this monitoring period.

During the course of the verification, 5 Corrective Action Requests (CARs) were raised and successfully closed.

After completing the verification activities, the verification team concluded that:

- All operations of the project are implemented and installed as planned and described in the registered PDD.
- The monitoring plan is in accordance with the applied approved CDM methodology, i.e. ACM0002 (ver.7.0) "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".
- The installed meters, which are essential for measurement of parameters required for emission reduction calculation, have been calibrated appropriately.
- The monitoring system is in place and fully functional. The project has achieved GHG emission reductions as intended.
- The information included in the revised monitoring report is correct and that the emission reduction achieved has been calculated in a conservative and appropriate manner without any material misstatements.

Based on the information seen and evaluated, the verification team confirms the following:

Project Title :	Taegisan Wind Power Project
UNFCCC ref no:	2302
Monitoring Report :	Ver. 02.0
Methodology used for verification :	ACM0002(ver.7.0.0)
Applicable monitoring period :	01/01/2017 – 31/12/2017
VVS version	VVS 1.0
Certified GHG emission reductions or net anthropogenic GHG removals for this monitoring period	50,056tCO ₂ e

SECTION H. Certification statement

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As above

Appendix 1. Abbreviations

Abbreviations	Full texts
ACM	Approved Consolidated Methodology
BOP	Balance Of Plant
CA	Corrective Action / Clarification Action
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CL	Clarification Request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
COP/MOP	The Conference of the Parties serving as the meeting of the Parties to the Protocol
DOE	Designated Operational Entity
EB	Executive Board
ER	Emission Reduction
FAR	Forward Action Request
GHG	Green House Gas
GIS	Gas Insulated Switchgear
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
KATS	Korea Agency for Technology and Standards
KEPCO	Korea Electric Power Corporation
KP	Kyoto Protocol
KPX	Korea Power Exchange
KTR	Korea Testing and Research Institute
MP	Monitoring Plan
MR	Monitoring Report
PDD	Project Design Document
PP	Project Participant
QA/QC	Quality Assurance / Quality Control
SCADA	Supervisory Control And Data Acquisition
TR	Transformer
UNFCCC	United Nations Framework Convention for Climate Change
VVS	Clean Development Mechanism Validation and Verification Standard
WTG	Wind Turbine Generator

Appendix 2. Competence of team members and technical reviewers

KTR

한국화학융합시험연구원

K O R E A T E S T I N G & R E S E A R C H I N S T I T U T E

Certificate of Authorization

Name : LEE, Bongjae
 Date of Birth : August 6th, 1978
 Certificate Number : 2016CDM - 002

We, KTR, hereby certify that above mentioned person is qualified for the technical areas specified below in compliance with Appendix 2 of CDM Accreditation Standard Ver 6.0 and Quality System of the KTR CDM.

Scope of Authorization :

CODE	TECHNICAL AREA	STATUS
1.1	Thermal energy generation	Lead Validator/Verifier
1.2	Energy generation from renewable energy sources	Lead Validator/Verifier
3.1	Energy demand	Lead Validator/Verifier
4.1	Cement and lime production	Lead Validator/Verifier
13.1	Solid waste and waste water	Lead Validator/Verifier

Valid until : July 19th, 2019

July 19th, 2016



한국화학융합시험연구원장
 Korea Testing and Research Institute





한국화학융합시험연구원

K O R E A T E S T I N G & R E S E A R C H I N S T I T U T E

Certificate of Authorization

Name : SHIN, Woochul
 Date of Birth : January 10th, 1957
 Certificate Number : 2017CDM - 005

We, KTR, hereby certify that above mentioned person is qualified for the technical areas specified below in compliance with Appendix 2 of CDM Accreditation Standard Ver 6.0 and Quality System of the KTR CDM.

Scope of Authorization :

CODE	TECHNICAL AREA	STATUS
10.1	Fugitive emissions from oil and gas	Part-time Validator/Verifier
11.1	Emissions of fluorinated gases	Part-time Validator/Verifier
11.2	Refrigerant gas production	Part-time Validator/Verifier

Valid until : December 18th, 2020

December 19th, 2017



한국화학융합시험연구원장
 Korea Testing and Research Institute





한국화학융합시험연구원

K O R E A T E S T I N G & R E S E A R C H I N S T I T U T E

Certificate of Authorization

Name : NOH, SeolJi
 Date of Birth : June 27th, 1990
 Certificate Number : 2017CDM - 009

We, hereby certify that above mentioned person is qualified for the technical areas specified below in compliance with Appendix 2 of CDM Accreditation Standard Ver 6.0 and Quality System of the KTR CDM.

Scope of Authorization :

CODE	TECHNICAL AREA	STATUS
1.2	Energy generation from renewable energy sources	Full-time Validator/Verifier

Valid until : December 18th, 2020

December 19th, 2017



한국화학융합시험연구원장



KTR

한국화학융합시험연구원

K O R E A T E S T I N G & R E S E A R C H I N S T I T U T E

Certificate of Authorization

Name : KIM, Kihong
 Date of Birth : February 26th, 1979
 Certificate Number : 2017CDM - 003

We, KTR, hereby certify that above mentioned person is qualified for the technical areas specified below in compliance with Appendix 2 of CDM Accreditation Standard Ver 6.0 and Quality System of the KTR CDM.

Scope of Authorization :

CODE	TECHNICAL AREA	STATUS
1.2	Energy generation from renewable energy sources	Lead Validator/Verifier
4.1	Cement and lime production	Lead Validator/Verifier
13.1	Solid waste and waste water	Lead Validator/Verifier

Valid until : December 18th, 2020December 19th, 2017

한국화학융합시험연구원장
 Korea Testing and Research Institute



Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1	PP	Final version of the PDD (ver.05.0)	http://cdm.unfccc.int/Projects/DB/KFQ1226904451.62/iProcess/KTRCert1516080827.98/view	PP
2	DOE(kfq)	The Final version of the validation report	http://cdm.unfccc.int/filestore/R/H/Z/RHZC4LOATDPU9X2NK8QIBWSFG70VE1/VR_Ver%2002.pdf?t=aUI8cDR5ZnRzfDCMq3bAw_rSy0opQe7X7ci-H	Others
3	DOE(JACO)	The 1 st verification report	http://cdm.unfccc.int/filestore/J/1/Q/J1Q26SGYHFA D95NWETU0CRV348BX7Z/Taegisan%201st%20Verification%20Report.pdf?t=RnN8cDR5Zng0fDDjlyOV00H_s5Pchxr_JlI0	Others
4	DOE(JACO)	The 2 nd verification report	http://cdm.unfccc.int/filestore/F/C/4/FC4Y8KA0N17WDRBJ6EIQMZS3HLX2TV/Verification%20ReportTaegisan%20WP_2nd.pdf?t=Y1I8cDR5ZncwfDDCeD1REKVKxqbHO3PpT8xJ	Others
5	DOE(JACO)	The 3 rd verification report	http://cdm.unfccc.int/filestore/g/f/FR2HM3GAVIZNL8CB6K9TE75UYO4WQJ.p df/Verification%20ReportTaegisan%203rd.pdf?t=dUN8cDR5Znl5fDAJASWY855m54ELy79evYtJ	Others
6	UNFCCC	ACM0002 methodology (Version 07)	N/A	
7	UNFCCC	CDM Validation and Verification Standard for project activities (ver.01.0)	N/A	Others
8	Ecoeye Co., Ltd. (Project consultant)	The MR (ver. 1)	N/A	PP
9	Ecoeye Co., Ltd. (Project consultant)	The MR (ver. 2)	N/A	PP
10	Ecoeye Co., Ltd. (Project consultant)	ER calculation sheet (ver. 1)	N/A	PP
11	Ecoeye Co., Ltd. (Project consultant)	ER calculation sheet (ver. 2)	N/A	PP
12	UNFCCC	MR template(version 6.0)	N/A	Others
13	PP	Drawing showing the monitoring points	N/A	PP
14	PP	Resistance calculation data	N/A	PP
15	PP	Electricity transmission line map	N/A	PP
16	POSCO	Document of the construction	N/A	Others
17	POSCO	The approval of the construction	N/A	Others
18	POSCO	The Statement for Starting Construction Work	N/A	Others
19	PP	Taking-Over Certificate (Phase 1)	N/A	PP
20	PP	Taking-Over Certificate (Phase 2)	N/A	PP
21	PP	Starting Commercial Operation for Wind Power	N/A	PP
22	PP	Actual reporting of monitoring results(daily, monthly)	N/A	PP
23	UNFCCC	CDM manual (1.4)	N/A	Others
24	UNFCCC	CDM manual (ver.1.5)	N/A	Others

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25	KEPCO	Statistics of Electric Power	N/A	Others
26	PP	internal database	N/A	PP
27	PP	sales records	N/A	PP
28	KEPCO	Monthly electricity bill	N/A	Others
29	Calibration entity	calibration/test reports	N/A	Others
30	KPX	Rules on the operation of electric utility market	N/A	Others
31	KEPCO	Electric meter test reports	N/A	Others
32	KTC	type approval standards	N/A	Others
33	KEPCO	Enforcement Decree of the Measures Act	N/A	Others
34	Calibration entity	Calibration certificates of Electric meters	N/A	Others
35	KPX	Monthly exchange amount of electric power	N/A	Others
36	Daeil Wire Co., Ltd., Conmolink Co., Ltd. and Taihan Electric Wire Co., Ltd	Transmission cable specifications	N/A	Others
37	PP	Specification of equipment	N/A	PP

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. Remaining FAR from validation and/or previous verifications

FAR ID	xx	Section no.	E.2	Date: DD/MM/YYYY
Description of FAR				
N/A				
Project participant response				Date: DD/MM/YYYY
N/A				
Documentation provided by project participant				
N/A				
DOE assessment				Date: DD/MM/YYYY
N/A				

Table 2. CL from this verification

CL ID	xx	Section no.		Date: DD/MM/YYYY
Description of CL				
N/A				
Project participant response				Date: DD/MM/YYYY
N/A				
Documentation provided by project participant				
N/A				
DOE assessment				Date: DD/MM/YYYY
N/A				

Table 3. CAR from this verification

CAR ID	CAR 1	Section no.	E.1	Date: 09/02/2018
Description of CAR				
The verification team noticed that Annex 1,2, and 3 referenced in the main text of the MR are missing in the MR (ver.1) and request the PP to include the Annexes. Therefore, the CAR 1 was raised.				
Project participant response				Date: 05/03/2018
The PP provided the verification team with Annex 1 Drawing showing the monitoring points, Annex 2 Electricity transmission line map, and Annex 3 Resistance calculation data.				
Documentation provided by project participant				
MR (ver.2) including Annex 1, 2, 3 ER calculation sheet (ver.2)				
DOE assessment				Date: 08/03/2018
The verification team reviewed the revised MR (ver.2) and confirmed that three missing Annexes was included in the revised MR (ver.2) and the data in the Annexes have been used correctly in the MR (ver.2) and the ER calculation sheet (ver.2). Therefore, CAR 1 has been closed successfully.				

CAR ID	CAR 2	Section no.	E.3	Date: 09/02/2018
Description of CAR				
The verification noticed that there were some operational events for troubleshooting and overhauling during the monitoring period and requested the details on the events (CAR 2).				
Project participant response				Date: 05/03/2018
The PP provided the verification team with the records on the operational events occurred during the monitoring period and added the details to the MR (ver.2).				
Documentation provided by project participant				
MR (ver.2) including Annex 1, 2, 3 The operation log and the raw data on the quantity of generated electricity				
DOE assessment				Date: 08/03/2018

The verification team reviewed the operation log and the raw data on the quantity of generated electricity to find that the quantity was recorded as 0 at the time of troubleshooting or overhaul and confirmed that these operational events occurred during the monitoring period were properly reflected in the revised MR (ver.2). Therefore, CAR 2 has been closed.

CAR ID	CAR 3	Section no.	E.3	Date: 09/02/2018
Description of CAR				
The verification team also noticed that monitoring and internal audit are performed by the same person according to the MR (ver.1) and the organization chart in the CDM manual (1.4). The team requested the PP to change the system in order to safeguard the impartiality of the operation (CAR 3).				
Project participant response				Date: 05/03/2018
The PP segregated the internal auditor and the monitoring manager and reflected this in the MR (ver.2) and the organization chart in the CDM manual (ver.1.5) accordingly.				
Documentation provided by project participant				
MR (ver.2) CDM manual (ver.1.5)				
DOE assessment				Date: 08/03/2018
The verification team reviewed the revised MR (ver.2) and the revised CDM manual (ver.1.5) to confirm the changes. With these changes, the internal audit shall be performed in an appropriate way by the vice president who is not involved in monitoring activities. Therefore, CAR 3 has been closed.				

CAR ID	CAR 4	Section no.	E.7	Date: 09/02/2018
Description of CAR				
The verification team reviewed the information on the meters for imported and exported electricity in the MR (ver.1), calibration/test reports/29/ and the applicable national law to confirmed that there was no calibration delay during the monitoring period. However, some information in the MR (ver.1) was not consistent with the verification team's observation during the site visit. Therefore, CAR 4 was raised.				
Project participant response				Date: 05/03/2018
The PP revised the MR (ver.2) based on the calibration reports and the test reports.				
Documentation provided by project participant				
MR (ver.2) The calibration reports and the test reports				
DOE assessment				Date: 08/03/2018
The verification team confirmed that the corrections were properly made. Therefore, CAR 4 has been closed.				

CAR ID	CAR 5	Section no.	E.8.1	Date: 09/02/2018
Description of CAR				
The verification team reviewed all the data related to GHG emission reduction calculation such as KPX data, KEPCO data, internal log on electricity generation, and etc. to confirm that data used in the MR (ver.1) and the ER calculation sheet (ver.1) is consistent with the data in the reviewed documents. However, treatment of the number of significant digit in the ER calculation was not consistent. Therefore, CAR 5 was raised.				
Project participant response				Date: 05/03/2018
PP revised ER calculation sheet (ver.2) as follow; In case of exported electricity, when combining daily data to monthly data, the verification team converted the unit from Wh to kWh and calculated monthly data in integer units by rounding down the first decimal point. In case of MWh loss for the transmission loss of imported electricity, the fourth decimal point was rounded up to the third decimal point for conservative calculation. In case of emission reduction, BE _y was calculated as the third decimal point by rounding down the fourth decimal point.				

Documentation provided by project participant	
ER calculation sheet (ver.2)	
DOE assessment	Date: 08/03/2018
The verification team determined that the PP's revised scheme for the number of significant digit in the ER calculation sheet (ver.2) is a conservative approach and acceptable. Therefore, CAR 5 has been closed.	

Table 4. FAR from this verification

FAR ID	xx	Section No.		Date: DD/MM/YYYY
Description of FAR				
N/A				
Project participant response				Date: DD/MM/YYYY
N/A				
Documentation provided by project participant				
N/A				
DOE assessment				Date: DD/MM/YYYY
N/A				

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
02.1	11 January 2018	Editorial revision to correct the numbering of appendices in the instructions.
02.0	31 October 2017	Revision to align with the requirements of the “CDM validation and verification standard for project activities” (version 01.0).
01.0	23 March 2015	Initial publication.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: project activities, verifying and certifying		