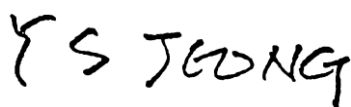




**Verification and certification report form for
CDM project activities
(Version 02.1)**

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	<ul style="list-style-type: none"> Title: Sihwa Tidal Power Plant CDM Project Reference number : 0349
Version number of the verification and certification report	Version 2.1
Completion date of the verification and certification report	12/06/2019
Monitoring period number and duration of this monitoring period	14 th monitoring period (1 st monitoring period in the 2 nd crediting period) Duration: 01/07/2018 ~ 31/12/2018
Version number of the monitoring report to which this report applies	Version 02.0
Crediting period of the project activity corresponding to this monitoring period	01/07/2018 ~ 30/06/2025 (Renewable, 7 years)
Project participants	Korea Water Resources Corporation (K-water)
Host Party	Republic of Korea
Applied methodologies and standardized baselines	ACM0002 (Version 17) Grid-connected electricity generation from renewable sources
Mandatory sectoral scopes	1-Energy industries (renewable - / non-renewable sources)
Conditional sectoral scopes, if applicable	No conditional sectoral scope(s) linked to the applied methodology
Estimated amount of GHG emission reductions or GHG removals for this monitoring duration in the registered PDD	126,576 tCO ₂ e (251,089 tCO ₂ e / 365 days × 184 days = 126,576 tCO ₂ e)
Certified amount of GHG emission reductions or GHG removals for this monitoring period	124,388 tCO ₂ e
Name and UNFCCC reference number of the DOE	<ul style="list-style-type: none"> Name : Korean Foundation for Quality (KFQ) Reference number : E-0025
Name, position and signature of the approver of the verification and certification report	Yu Shim JEONG  Managing Director of Sustainability management institute

SECTION A. Executive summary

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Korean Foundation for Quality (hereinafter KFQ) has performed periodic verification of the CDM project “Sihwa Tidal Power Plant CDM Project” in Ansan city, Republic of Korea, UNFCCC Registration Ref. No. 0349 for the period from 01/07/2018 to 31/12/2018.

Verification objective

Verification is the periodic, thorough and independent assessment and ex-post determination by a Designated Operational Entity (hereinafter DOE) of the monitored reductions in greenhouse gas (hereinafter GHG) emissions that have occurred as a result of the registered CDM project activity during a defined monitoring period. Certification is the written assurance by a DOE that, during a specific period in time, a project activity achieved the emission reductions as verified.

The objective of this verification was to verify and certify emission reductions reported for the “Sihwa Tidal Power Plant CDM Project” for the period from 01/07/2018 to 31/12/2018 in accordance with paragraph 62 of CDM modalities and procedures.

Verification scope

The scope of the verification is to verify that:

- The project activity has been implemented and operated in accordance with the registered PDD and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place.
- The monitoring report and other supporting documents provided are complete in accordance with latest applicable version of the completeness checklist for requests for issuance of CERs and verifiable and in accordance with applicable CDM requirements.
- The monitoring plan complies with the monitoring methodology and the actual monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan and the approved methodology including applicable tools and compliance with any guidance provided by the CDM Executive Board regarding deviations from the provisions of a registered plan and/or methodology.
- Data is recorded and stored as per the monitoring methodology ACM0002 (Version 17), and the calculation of GHG emission reductions have been assessed to correctly support the emission reductions being claimed.

Furthermore, it was KFQ’s objective to identify any concerns related to the conformity of the actual project activity and its operation with the registered project design document and determine whether any deviation or proposed or actual changes in the implementation or operation of the project activity comply with the requirements of the Project Standard.

The verification shall ensure that reported emission reductions are complete and accurate in order to be certified. The verification is incorporating both quantitative and qualitative information on emission reductions.

Verification process

KFQ has made publicly available the monitoring report received from the project participant (hereinafter PP). Only verification activities after the publication of the Monitoring report (hereinafter MR) on the UNFCCC CDM website have been used as a basis for conclusion of verification.

The verification process includes desk review of the MR published (and any updated versions, if available), emission reduction calculation spreadsheets and other supporting documents and data. Further, on-site assessments and interviews with those involved in project management and operations are conducted. This is followed by preparation of draft verification report summarizing desk review and on-site assessment findings (i.e. CARs, CLs, and FARs). Upon successful closing of the CARs, CLs and FARs raised (if any), the final verification report is prepared. The draft verification report reviewed by a technical reviewer according to KFQ's internal quality assurance procedures. If no further findings are raised the final verification report is prepared and reviewed once again.

The data presented in the MR were assessed by review of the detailed project documentation and relevant records of data, as well as by interviews with personnel at Korea Water Resources Corporation (hereinafter K-water) Sihwa Tidal Power Plant, and observation of collection of measurements, observation of established monitoring and reporting practices and assessment of the reliability of monitoring equipment. This has enabled the verification team to assess the accuracy and completeness of reported monitoring results, as well as to verify the correct application of the approved monitoring methodology. Furthermore, this has enabled the verification team to assess and determine that the implementation and operation of the project activity as well as the steps taken to report emission reductions in compliance with the CDM criteria and relevant guidance provided by the Board. In addition, all parameters, as required (and as applicable) by the monitoring methodology ACM0002 (Version 17) as well as the monitoring plan in the registered PDD and the management system were assessed during the on-site visit.

Description of the project activity

The "Sihwa Tidal Power Plant CDM Project" generates electricity utilizing the difference of ebb and flow of tide which emits zero GHG into the air, and increase of sea/inner water circulation by this activity will improve the water quality that has been decreased during Sihwa Lake's salt-to-fresh water process. The project activity consists in 10 units of 25.4MW turbines and generators and the capacity of the project activity is 254 MW. The electricity generated by the project activity is supplied to the Korea Electric Power Corporation (hereinafter KEPCO) grid (national grid).

The physical components including the equipment for turbines and generators were confirmed as described in the registered PDD.

Project Title	Sihwa Tidal Power Plant CDM Project (PDD Version 04.0, dated 20/09/2018)	
UNFCCC Registration Number	0349	
Project Participant	Korea Water Resources Corporation (K-water)	
Location of the project	Address	Daebudong-dong, Danwon-gu, Ansan city, Gyeonggi-do, Republic of Korea
	GPS Coordinates	Longitude: 126°36'36"E Latitude: 37°18'46"N
Date of registration	18 June 2006 (1 st crediting period, 01/07/2011 ~ 30/06/2018)	
Date of renewal	04 January 2019 (2 nd crediting period, 01/07/2018 ~ 30/06/2025)	
Monitoring period of this verification	1 July 2018 to 31 December 2018 (1 st monitoring period in the 2 nd crediting period)	

Conclusion

KFQ has performed the verification of the emission reductions reported for the project activity 'Sihwa Tidal Power Plant CDM Project' in the Republic of Korea (UNFCCC Registration Ref. No. 0349) for the period from 01/07/2018 to 31/12/2018.

The verification of the emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project. All relevant records of data from K-water internal system and KEPCO have been examined and verified for the reporting period.

The verification team has during its preparation identified the key reporting risks and used the assessment to determine to which extent the project operator's internal system was adequate for mitigation of these key reporting risks. In addition, other areas that can have an impact in reported emission reductions have also undergone detailed audit testing.

KFQ also confirms that the GHG emission reductions are calculated without material misstatements. Our opinion refers to the project's GHG emissions and resulting GHG emission reductions reported, both determined using the valid and registered project's baseline, its monitoring plan in the registered PDD and its associated documents.

The implementation of the project resulted in 124,388 tCO₂e of emission reductions during the monitoring period from 01/07/2018 to 31/12/2018 which is within the crediting period from 01/07/2018 to 30/06/2025. In our opinion, the GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology ACM0002 (Version 17) and monitoring plan in the Project Design Document of Version 04.0 dated 20/09/2018.

KFQ is able to certify that the emission reductions from the 'Sihwa Tidal Power Plant CDM project' in Republic of Korea during the period from 01/07/2018 to 31/12/2018 amount to 124,388 tCO₂e.

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	PARK	Su Hyun	KFQ	√	√	√	√
2.	Verifier (*)	IR	LEE	Mi Jung	KFQ	√	-	-	√
3.	Verifier (*)	IR	JANG	Pyung Hee	KFQ	√	√	√	√
4.	Verifier (*)	IR	MOON	Sung Sam	KFQ	√	√	√	√

(*) means a personnel with technical expertise in technical area 1.2.

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	KANG	Yeong Gyeong	KFQ
2.	Approver	IR	JEONG	Yu Shim	KFQ

Please refer to Appendix 2 below for demonstration of how the team meets the competence required for the verification.

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	Number of Monitoring parameters	L	Not large number of monitoring points to measure directly.	The KFQ verification team included four verifiers in total and three of them participated in on-site to review all monitoring parameters in a complete and detailed manner.
2	Error rate in MR	L	This is 14 th monitoring period (1 st monitoring period of 2 nd crediting period). The PP has a high maturity in compilation of MR.	In response of that risk, the KFQ verification team focuses on systematic consistency and error checks
3	Familiarity with Monitoring system	L	This is 14 th monitoring period (1 st monitoring period of 2 nd crediting period). There are no any special changes of monitoring system, i.e. process and monitoring point since the project activity was begun.	In response to that risk, the KFQ verification team checks the existence of all measuring instruments and their calibration even though PP is familiar with monitoring system.
4	QA/QC	L	Stable QA/QC system has been implemented and with QMS & EMS.	Focus on crosschecking between raw data from “central control system of K-water” and references, i.e. Korea Power Exchange (hereinafter KPX) data and receipt of sales issued by KPX and KEPCO.
5	Data flow	M	Transferred to the spread sheet automatically.	For ER calculation, crosscheck raw data with spread sheet on a random sampling basis extent to ensure the functioning of transferring system.
6	Calculation	M	Calculation is performed in excel spreadsheet applying formulae.	In response of that risk, the KFQ verification team checks any omissions of events affecting emission reductions.

KFQ's verification plan draws on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. KFQ planned the verification by obtaining evidence and other information and explanations that KFQ considers necessary to give reasonable assurance on the reported GHG emission reductions on the basis of risk level identified and materiality concept in accordance with "Guideline on the application of materiality in verifications (Version 02)".

C.2. Consideration of materiality in conducting the verification

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There were four findings detected, but they do not impact the amount of emission reductions. As the findings could be considered as simple error, not systematic reoccurring error, the verification team decided that no additional audit procedures need to be conducted in order to reach a reasonable level of assurance that the claimed emission reductions in the MR are free from material error, omission or misstatement. Accordingly, verification and sampling plan were not revised.

SECTION D. Means of verification

D.1. Desk/document review

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KFQ's verification is based on the monitoring documentation provided by the PP especially the MR (Version 01 dated 05/04/2019, published on 09/04/2019) and the CDM Project spreadsheets. Furthermore, the registered PDD and validation report were reviewed as well as the monitoring plan, previous verification reports, the applied baseline and monitoring methodology and any other information and references relevant to the project activity's emission reductions (e.g. IPCC reports, etc.). A complete list of all documents reviewed is shown in Appendix 3 of this verification report. KFQ's verification process takes into consideration all the CDM Rules and Guidance applicable to the project activity, e.g. CDM Validation and Verification Standard for Project Activities, CDM Project Standard, CDM Project Cycle Procedure, Checklist for requests for issuance for project activities and relevant decisions, clarifications and guidance from the CMP and the CDM EB.

During the desk review, KFQ has applied standard auditing techniques to assess the quality of information provided. The following activities were performed:

- Verify the compliance of the MR with the guidance for completing the monitoring report form
- Verify the completeness of the data and the information presented in the MR;
- Review the monitoring plan and monitoring methodology. Check the compliance of the MR with respect to the monitoring plan in the registered PDD and verify that the applied methodology was carried out. Particular attention to coverage of all monitoring parameters, the frequency of measurements, the quality of the metering equipment including calibration requirements, and the quality assurance and quality control procedures was paid,
- Review the calculations and assumptions used to obtain the GHG data and ER;
- Evaluate the data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

D.2. On-site inspection

Detailed verification of all data contained in the MR was performed during the site visit at Sihwa Tidal Power Plant on 10/05/2019. During the site visit, the personnel were interviewed or assisted the verification team. During the on-site assessment, KFQ has applied standard auditing techniques to assess the quality of information provided. The following aspects of the CDM project activity have been confirmed:

- The implementation and operation of the CDM project activity;
- The information flow for generating, aggregating, recording, calculation and reporting of the monitoring parameters; and
- The operational and data collection procedures and their implementation in accordance with monitoring plan.

Further, the following activities were performed:

- A cross-check between information provided in the MR and data from other sources such as plant log books, Records of electricity generated, electricity exported and electricity imported, or similar data sources;
- A check of the monitoring equipment including calibration performance and observations of monitoring practices against the requirements of the PDD, the monitoring plan and ACM0002 (Version 17);
- A review of calculations and assumptions made in determining the GHG data and emission reductions; and
- An identification that quality control and quality assurance procedures are in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.

Duration of on-site inspection: 10/05/2019				
No.	Activity performed on-site	Site location	Date	Team member
1.	Confirmation of the correct & complete implementation and operation of the Project Activity and check of all physical features as described in the PDD are in place.	Ansan	10/05/2019	Su Hyun PARK Pyung Hee JANG Sung Sam MOON
2	Review of the complete data flow from data generation, aggregation, recording, calculation to reporting of the monitoring parameters.	Ansan	10/05/2019	Su Hyun PARK Pyung Hee JANG Sung Sam MOON
3	Confirmation of the complete & correct implementation of procedures for the operation and data collection.	Ansan	10/05/2019	Su Hyun PARK Pyung Hee JANG Sung Sam MOON
4	Verification of the information provided in the MR and documentation with other sources.	Ansan	10/05/2019	Su Hyun PARK Pyung Hee JANG Sung Sam MOON
5	Check of the monitoring equipment against the PDD, the monitoring plan as well as the approved methodology, including check of calibration & maintenance, etc. in relation to that equipment.	Ansan	10/05/2019	Su Hyun PARK Pyung Hee JANG Sung Sam MOON
6	Identification whether suitable QA/QC procedures are in place in order to prevent errors or to enable the corrections of errors and omissions in the reported parameters.	Ansan	10/05/2019	Su Hyun PARK Pyung Hee JANG Sung Sam MOON

D.3. Interviews

A list of the persons interviewed during this verification activity is included in table below.

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	KIM	Deog Je	K-water	10/05/2019	General support	Su Hyun PARK Pyung Hee JANG Sung Sam MOON
2	KIM	Min Jin	K-water	10/05/2019	CDM coordination	Su Hyun PARK Pyung Hee JANG Sung Sam MOON
3	LEE	Myung Won	K-water	10/05/2019	Plant operation	Su Hyun PARK Pyung Hee JANG Sung Sam MOON

D.4. Sampling approach

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As per the requirements set out in CDM Validation and Verification Standard for Project Activity (Version 02.0), random sampling has been applied, as relevant for the present case in the Project Activity, where no sampling approach was applied by the PP.

Since automatic transferred system to the spread sheet is in place, crosscheck for data in spread sheet against raw data was done based on random sampling after confirming measure for raw data in the central control system of K-water. Sampling plan which the verification team planned needed not to be revised as no omission in the detection process of events related to emission reductions were found. And all abnormal figures in data on the ER sheet, the locations and calibrations of all measurement instruments as well as its intervals (Measuring frequency, Reading frequency, Recording frequency) were assessed.

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	0	0
Compliance of the project implementation and operation with the registered PDD	0	1	0
Post-registration changes	0	0	0
Compliance of the registered monitoring plan with the methodologies including applicable tools and standardized baselines	0	1	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	1	0	0
Assessment of reported sustainable development co-benefits	0	0	0
Global stakeholder consultation	0	0	0
Others (please specify)	0	0	0
Total	1	3	0

The objective of this phase of the verification was to resolve any issues which were needed to be clarified prior to KFQ's conclusion that i) the project activity has been implemented and operated in accordance with the registered PDD or any approved revised PDD, ii) the monitoring plan complies with the monitoring methodology and the actual monitoring complies with the monitoring plan including

any guidance provided by the Board regarding deviation from the provisions of a registered/revised plan and/or methodology and iii) the data and calculation of GHG emission reductions are correct.

A corrective action request (CAR) is issued, where:

- i. Non-conformities with the monitoring plan or methodology are found in monitoring and reporting and has not been sufficiently documented by PP, or if the evidence provided to prove conformity is insufficient;
- ii. Modifications to the implementation, operation and monitoring of the registered project activity have not been sufficiently documented by PP;
- iii. Mistakes have been made in applying assumptions, data or calculations of emission reductions which will impact the quantity of emission reductions;
- iv. Issues identified in a FAR during validation or previous verification(s) to be verified during next verification have not been resolved by PP.

A clarification request (CL) shall be raised if information is insufficient or not clear enough to determine whether the applicable CDM rules and requirements have been met.

A forward action request (FAR) is issued for actions if the monitoring and reporting require attention and/or adjustment for the next monitoring period.

Three CARs and one CL were raised for this monitoring period, which were closed successfully after PP have submitted MR Version 02.0.

SECTION E. Verification findings

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

Means of verification	KFQ has checked the MR provided by the PP against the latest MR form in order to determine whether the MR is in compliance with it.
Findings	It was found that there are no deviations between the MR and the latest monitoring report form (Version 06.0)
Conclusion	The verification team concludes that the MR (Version 02.0) is in compliance with the latest monitoring report form (Version 06.0) and the instruction therein.

E.2. Remaining forward action requests from validation and/or previous verifications

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FAR was not issued from previous verification.

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

Means of verification	<p>Physical project implementation</p> <p>During the on-site visit, the KFQ verification team visually inspected the installations of the tidal power plant and all instrumentation necessary for the monitoring of the emission reductions and check, whether all physical features of the CDM Project activity, including the data collection systems and storage, have been implemented in accordance with the registered PDD.</p> <p>Project operation</p> <p>The verification team checked the operational records and other relevant information (Appendix 3) and interviewed relevant plant staff on the actual operation of the plant. Also, documented daily operation report, daily exported electricity record, the central control system of K-water especially with regard to times with events as indicated in</p>
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	<p>the MR were checked.</p> <p>Management system and quality control and quality assurance The documents such as 'Internal Manual in Emergency', 'Sihwa Tidal Power Plant Operation Manual' and 'Monitoring Manual' have been reviewed. Furthermore, the latest organizational arrangements were checked by means of interviews with relevant staff from K-water.</p> <p>Consecutive monitoring period The verification team checked monitoring period of previous verifications through interviews with staff from K-water as well as history of requests for issuance provided by UNFCCC website to confirm consecutive monitoring periods of this project activity.</p>																								
Findings	<p>Physical project implementation The project activity was registered on 18 June 2006 and the construction was completed on 14 November 2011. After then the operation started on 13 April 2011 and the commercial operation started on 1 March 2012 which was checked through notification sent by PP to the Government. Due to delay of the construction, the PP changed the 1st crediting period from 01 July 2009~30 June 2016 to 01 July 2011~30 June 2018, and this change accepted by UNFCCC. The first crediting period (01/07/2011~30/06/2018) renewed and second crediting period was approved on 4 January 2019 for the period of 01/07/2018 ~ 30/06/2025. This monitoring period is the first monitoring of the second crediting period</p> <p>The detail implementation history as follow:</p> <table border="1"> <thead> <tr> <th>Activities</th><th>Time (period)</th><th>Remarks</th></tr> </thead> <tbody> <tr> <td>Construction</td><td>31/12/2004~14/11/2011</td><td>Construction completion report</td></tr> <tr> <td>Starting date of operation</td><td>13/04/2011</td><td>Grid connection approval</td></tr> <tr> <td>Commission period</td><td>28/03/2011~29/02/2012</td><td>Test run plan</td></tr> <tr> <td>Start date of commercial operation</td><td>01/03/2012</td><td>Start-up business notification to the government (Ministry of Knowledge Economy)</td></tr> <tr> <td>Continued operation</td><td>13/04/2011~present</td><td>Grid connection approval</td></tr> <tr> <td>1st~13th monitoring period (1st crediting period)</td><td>01/07/2011~30/06/2018</td><td>1st~13th monitoring reports and verification reports</td></tr> <tr> <td>Approval date of crediting period renewal</td><td>04/01/2019</td><td>Validation report for crediting period renewal</td></tr> </tbody> </table> <p>The implementation status of the project activity was the same during the monitoring period and found to be in accordance with the relevant documentation.</p> <p>All physical features (technology, project equipment and monitoring/metering equipment) of the project are in place as per the registered PDD. And there is no any change such as capacity, number of units, addition of component, extension of technology, actual operational parameters differing from the expected parameters etc. PDD.</p> <p>Project operation The Sihwa Tidal Power Plant as well as the central control system of K-water were in normal operation during this monitoring period. Operation of the monitoring system & data collection system were operational during the monitoring period - the maintenance/calibration periods of the monitoring instruments performed during the monitoring period and as described in the MR are complete.</p>	Activities	Time (period)	Remarks	Construction	31/12/2004~14/11/2011	Construction completion report	Starting date of operation	13/04/2011	Grid connection approval	Commission period	28/03/2011~29/02/2012	Test run plan	Start date of commercial operation	01/03/2012	Start-up business notification to the government (Ministry of Knowledge Economy)	Continued operation	13/04/2011~present	Grid connection approval	1 st ~13 th monitoring period (1 st crediting period)	01/07/2011~30/06/2018	1 st ~13 th monitoring reports and verification reports	Approval date of crediting period renewal	04/01/2019	Validation report for crediting period renewal
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Approval date of crediting period renewal	04/01/2019	Validation report for crediting period renewal																							

During the site visit, sample review of raw data to check all operational information were reported on the MR.

For this monitoring period, lasting 184 days, no special events, i.e. emergency and/or dispute occurred.

However, in the course of document review, verification team identified that generator #1~#4 didn't work during some days within this monitoring period thus electricity generation was recorded as '0' but exact date of non-operation was not provided in MR version 1.0 and evidence of it was not provided during on-site assessment. (**Refer to Appendix 4/Table 3/CAR ID 01**). PP submitted revised MR (Version 02.0) including the information of dates and reason of four operational cases listed in the section B.1 of the monitoring report

Date	Operational events
21/08/2018	Due to very little head drop of ebb tide, generator #1~#4 did not work(The data of the meter #1 was zero). The other generator worked a little, so total exported electricity was not zero on each date.
18/09/2018 - 20/09/2018	
17/10/2018 - 19/10/2018	
17/11/2018	

The verification team checked each case by checking daily operation report of above mentioned dates and interviewing relevant plant staff on the actual operation of the plant. K-water does not open all gates at once to ensure stable generation. When the water level rises, generators # 5~10 are started first, and # 1~4 are running slowly after that. If the flow rate does not reach the constant flow rate, the generator does not work, so power generation amount of the # 1-4 generator was recorded as '0' in that period. We checked the tidal data and generation time of 10 generators for the entire monitoring period provided by the PP. We identified the generation time and tidal range for days with a power generation of '0' and those with significantly less power generation than the other periods in the above table.

The verification team confirmed that those operational situations described in the monitoring report is correspond to the daily operation report and it was clearly described in the MR (Version 02.0).

KFQ confirms that no emissions reductions were claimed for those periods when Sihwa tidal power plant stopped the operation in accordance with the registered PDD, applied methodology and the requirements from VVS. And it is clearly and correctly reflected in the emission reduction calculation spreadsheet.

Management system and quality control and quality assurance

The PP, K-water has the overall authority and responsibility for project operation. Also the PP has the responsibility for the monitoring of all parameter for the calculation of emission reduction accounting and reporting.

The central control system of K-water is designed as an automatic process, so the involvement of the personnel during the normal operation is minimized. The key parameters have been measured and recorded in the central control system of K-water and the data is cross-checked with KPX data (exported) and monthly receipts of sales issued by KEPCO (imported). All measuring meters are periodically calibrated according to the national regulation. The PP has established internal manual in emergency, Sihwa Tidal Power Plant Operation Manual, and any emergency and dispute did not occur during this monitoring period.

The designated staffs for monitoring of the project activity are duly trained as operation, technique and CDM monitoring according CDM monitoring manual. Also PP is ISO 9001 and ISO 14001 certified.

The verification team confirms that management system and quality assurance related procedures have implemented as the monitoring plan of the registered PDD.

Consecutive monitoring period

This is the 14th monitoring period since registration of this project activity. A previous monitoring report was published on the UNFCCC CDM website in a consecutive manner and completed verification of their respective monitoring periods. Thus, the

	verification team of this monitoring period confirmed that monitoring periods of this project have been consecutive.
Conclusion	<p>KFQ confirms that the project has been implemented according to the description in the registered PDD.</p> <p>The verification team specifically confirms that</p> <ul style="list-style-type: none"> • All physical features of the proposed CDM project activity including data collection systems and storage are in place and in accordance with the registered PDD; and • All other relevant information provided in the MR is fully in accordance with respective information stated in the registered PDD (version 04.0); • The information on project operation, the management system and quality assurance are complete, correct and in accordance with the registered PDD; and • The management system and quality assurance and related procedures have implemented as described in the MR and in accordance with the registered PDD; and • The monitoring periods of this project have been consecutive. <p>The raised CAR (ID 01) has been completely resolved.</p>

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 confirmed that there is no temporary deviation for this monitoring period.

However, there was temporary deviation as below during 12th and 13th verifications approved by the Board.

- PRC-0349-005 (Approved on 01/03/2019)
 - K-water changed monitoring method of parameter GENy and EF_{BM}.

E.4.2. Corrections

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There was no correction identified by verification team during this verification

However, there were corrections as below during 1st, 2nd and 5th verifications approved by the Board.

- PRC-0349-001 (Approved on 23/11/2012)
 - K-water updated the project participant as a result of withdrawal of Ecoeye(consulting company).
 - K-water changed the abbreviation of Korea Water Resources Corporation from KOWACO to K-water.
 - K-water corrected the version number of the applied methodology (ACM0002) from version 3 to version 4.
- PRC-0349-002 (Approved on 03/05/2013)
 - K-water corrected the geo-coordination of the power plant as follow:
Latitude: 126°4'W → 37°18'46"N
Longitude: 37°2'N → 126°36'36"E
- PRC-0349-003 (Approved on 30/10/2014)

- K-water changed the abbreviation of Korea Water Resources Corporation from KOWACO to K-water.
- K-water updated the monitoring structure according to the changes of role and responsibility of related monitoring departments.

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

>>

There were no post registration changes identified by verification team during this verification.

However, there was start date of the crediting period of the project activity change from 01/07/2009 to 01/07/2011 and it approved by the Board on 26/04/2011.

E.4.4. Inclusion of a monitoring plan

>>

Not applicable

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

>>

There were no post registration changes identified by verification team during this verification.

However, there were permanent changes from registered monitoring plan as below during 1st verifications and renewal of crediting period approved by the Board.

- PRC-0349-001 (Approved on 23/11/2012)
 - K-water changed the type of watt-hour meters from bidirectional meters to unidirectional metes.
 - K-water changed the calibration frequency of watt-hour meters for measuring imported electricity from 2 years to 7 years.
- PRC-0349-004 (Approved on 04/01/2019)
 - K-water changed the monitoring plan of energy meters for exported and imported electricity to be calibrated properly in accordance with the national regulations.

E.4.6. Changes to the project design

>>

There were no post registration changes identified by verification team during this verification.

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

>>

Not applicable

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

Means of verification	The KFQ verification team reviewed the monitoring plan contained in the registered PDD against the approved methodology applied by the project activity, ACM0002
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	(Version 17) and “Tool to calculate the emission factor for an electricity system” (Version 6.0).
Findings	<p>The KFQ verification team found that there were no incompliances between the registered monitoring plan, the applied methodology ACM0002 (Version 17) and “Tool to calculate the emission factor for an electricity” (Version 6.0). Furthermore, it was found that there are no standardized baselines applied in the project activity.</p> <p>However, according to the instructions for completing CDM-MR-FORM, methodological tools to which the applied methodology refers has to be indicated in the section A.4 of MR but the applied tool (Tool to calculate the emission factor for an electricity system) was not indicated in the section of MR (version 1.0) <u>(Refer to Appendix 4 / Table 3 / CAR ID 02).</u></p> <p>In response to CAR ID 02, PP indicated the exact title, version and UNFCCC reference number of applied methodological tool (Tool 07) which refers applied methodology ACM0002 in the section A.4 of the revised MR (Version 02.0).</p>
Conclusion	<p>KFQ confirms that the monitoring plan contained in the registered PDD is in accordance with the approved methodology applied by the project activity, ACM0002 (Version 17) and “Tool to calculate the emission factor for an electricity system” (Tool07, Version 6.0).</p> <p>There is no applicable standardized baselines for the project activity.</p> <p>The raised CAR (ID 02) has been completely resolved.</p>

E.6. Compliance of monitoring activities with the registered monitoring plan

General statement on data and parameters monitored

Means of verification	The means of verification in relation to the different parts (information flow and data collection system, monitoring parameters and survey on the post environmental impacts) are stated in detail in the section & tables further below.
Findings	The findings in relation to the different parts (information flow and data collection system, monitoring parameters are stated in detail in the section & tables further below.
Conclusion	<p>KFQ confirms that the monitoring is complete and has been carried out in accordance with the monitoring plan and any monitoring activities comply with it. The monitoring plan in the registered PDD has been properly implemented and is followed by the PP.</p> <p>KFQ confirms that all parameters stated in the monitoring plan in the registered PDD have been monitored and updated as applicable, including project emission parameters, baseline emission parameters (leakage is not applicable) and management and operational system: the responsibilities and authorities for monitoring and reporting are in accordance with the responsibilities and authorities stated in the monitoring plan.</p> <p>KFQ confirms that the equipment used for monitoring is controlled and calibrated in accordance with the monitoring plan in the registered PDD, the applied methodology as well as the relevant guidance provided by the CDM Executive Board. Details on calibration are given in section E.7 below.</p> <p>KFQ confirms that monitoring results are consistently recorded as per the approved frequency.</p> <p>KFQ confirms that QA/QC procedures have been applied in accordance with the monitoring plan in the registered PDD.</p> <p>KFQ confirms that the MR lists each parameter required by the monitoring plan in the registered PDD and the information flow (i.e. from data generation, aggregation, recording, calculation and reporting) for these parameters is provided in the MR (The information flow for each parameter is further verified in the following sections).</p> <p>KFQ confirms that the monitoring methodologies and sustaining records are sufficient to enable verification of emission reductions.</p>

E.6.1. Data and parameters fixed ex ante or at renewal of crediting period

Means of verification	Data and parameters fixed ex-ante as listed in the MR have been crosschecked & reviewed – as applicable-against the monitoring plan in the registered PDD as well as against the applied methodology (ACM0002, Version 17) and other relevant CDM related documentation.			
Findings	Detailed assessment on ‘Data and parameters fixed ex ante’ is as below;			
	Data/parameter (unit, description)	Source of data	Value(s) applied	KFQ Findings
	• EF_{grid,CM,y} tCO ₂ e/MWh, CO ₂ emission factor of the grid	Registered PDD/ACM0002 , Version 17)	0.5197	Crosscheck of the value with the registered PDD & Monitoring plan and the applied methodology showed compliance of parameter
	• EF_{grid,OM,y} tCO ₂ e/MWh, CO ₂ emission factor of the grid	Registered PDD/ACM0002 , Version 17)	0.7043	Crosscheck of the value with the registered PDD & Monitoring plan and the applied methodology showed compliance of parameter.
	• EF_{grid,BM,y} tCO ₂ e/MWh, CO ₂ emission factor of the grid	Registered PDD/ACM0002 , Version 17)	0.4582	Crosscheck of the value with the registered PDD & Monitoring plan and the applied methodology showed compliance of parameter
Conclusion	KFQ confirms that all data and parameters fixed ex ante such as emission factors, etc. are explicitly mentioned in the MR and have been correctly and consistently applied. All values are in compliance with relevant documentation such as the monitoring plan and the registered PDD, applied methodology ACM0002 (Version 17.0) and other CDM related documentation, where applicable.			

E.6.2. Data and parameters monitored**Information flow & data collection system**

Means of verification	<p>The verification team assessed the information flow (where applicable) and data collection system of all monitoring parameters by means of physical inspection of all major components of the information flow & data collection system as well as related documentation. Interviews with relevant staff were held in order to experience the system in action. Furthermore, the following documents were reviewed and cross checked.</p> <p>Data generation and aggregation:</p> <ul style="list-style-type: none"> • Meters' readings • Calibration records and certificates <p>Aggregation to recording:</p> <ul style="list-style-type: none"> • Daily and monthly exported electricity generation data ("central control system of K-water") • KPX data from e-power market in KPX website (http://kpx.or.kr) • Monthly imported electricity data from KEPCO i-SMART system • Receipts of sales issued by KPX (export) and KEPCO (import) <p>Calculation and reporting:</p> <ul style="list-style-type: none"> • Crosscheck of implemented calculations in Excel sheets against the PDD formulae • Data cross check between monthly report generated by the PP and Excel Sheets
Findings	As stated in the MR and verified by the KFQ verification team, the common data flow

	<p>system is used in the project activity for the following parameters:</p> <ul style="list-style-type: none">Net amount of electricity transmitted to the grid ($EG_{PJ,y}$) <p>The verification team checked 10 Watt-hour meters which are consistent with the PDD's monitoring plan. Export main meters, M1, M3 and M5 measures exported electricity to the grid and export sub meters, M2, M4 and M6 are used for malfunction of export main meters. Imported electricity is measured by import main meters, M7, M8, M9 and import sub meter, M10. The amount of power transmitted by each generator is measured in each watt-hour meter. Therefore, the sum of each electricity in $EG_{PJ,y}$ is not calculated in duplicate.</p> <table><tr><th colspan="2">Generators #</th><th>#1</th><th>#2</th><th>#3</th><th>#4</th><th>#5</th><th>#6</th><th>#7</th><th>#8</th><th>#9</th><th>#10</th></tr><tr><td rowspan="2">Meter for electricity export</td><td>Main meter</td><td colspan="4">M1</td><td colspan="4">M3</td><td colspan="2">M5</td></tr><tr><td>Sub meter</td><td colspan="4">M2</td><td colspan="4">M4</td><td colspan="2">M6</td></tr><tr><td rowspan="2">Meter for electricity import</td><td>Main meter</td><td colspan="4">M7</td><td colspan="4">M8</td><td colspan="2">M9</td></tr><tr><td>Sub meter</td><td colspan="10">M10</td></tr></table> <p>The amount of electricity exported to the grid is continuously measured by export main meters, M1, M3 and M5. Each data from these 3 main meters simultaneously is transferred to the central control system of K-water which is PP's ERP system and KPX system. The measured data is collected daily, weekly and monthly and is archived in electronic way. The amount of electricity exported to the Grid was cross-checked by K-water and KPX and it is confirmed as electricity exported to the grid from the project activity and it is confirmed through monthly KPX sales receipts. And the amount of electricity imported from the grid is continuously measured by import meters, M7, M8, M9 and import sub meter, M10. These 4 meters are controlled by KEPCO and measured electricity of each meters are transferred to KEPCO and recorded internal system (central control system of K-water) too. The measured imported electricity from the Grid was cross-checked against receipts of sales issued by KEPCO.</p> <p>It was found by the KFQ verification team that the information flow and data collection system were fully functional and were so during the whole verification period covered under this verification. Respective documents and results were made available to KFQ for verification.</p>	Generators #		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	Meter for electricity export	Main meter	M1				M3				M5		Sub meter	M2				M4				M6		Meter for electricity import	Main meter	M7				M8				M9		Sub meter	M10									
Generators #		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10																																																
Meter for electricity export	Main meter	M1				M3				M5																																																	
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Meter for electricity import	Main meter	M7				M8				M9																																																	
	Sub meter	M10																																																									
Conclusion	<p>The KFQ verification team confirms that the information flow & data collection system meets the requirements of the registered PDD and its monitoring plan as per the applied and approved methodology ACM0002 (Version 17). Intervals (measuring frequency, reading frequency and recording frequency) are applied in accordance with the applied methodology and the monitoring plan.</p>																																																										

Assessment on data/ parameters

Detailed assessment on data and parameters monitored is described as below;

The table out of the CDM-VCR-FORM has been used for the assessment, following rows as needed have been added: Data/Parameter, Unit, Description, Source of data used, Value(s)

Data/Parameter	$EG_{PJ,y}$
Data Unit	MWh
Description	Net amount of electricity transmitted to the grid excluding electricity consumed in the plant
Source of data used	Watt-hour meter
Value(s)	<u>239,346.741 MWh</u> - Total electricity transmitted to the grid is <u>241,468.893 MWh</u> - Total imported electricity is <u>2,122.152 MWh</u>
Means of verification	The KFQ verification team checked, whether the monitoring activities in relation to this parameter comply with the monitoring plan in the registered PDD by physically inspecting the applied measuring meters for generation, aggregation, recording and reporting.

	<p>The verification team reviewed the exported electricity generation data (hourly, daily and monthly) and cross-checked with the receipts of sales issued by KPX. We checked the measured record for imported electricity and cross-checked with the receipts of sales issued by KEPCO.</p> <p>Furthermore, procedures and records on calibration, maintenance and QA/QC activities have been reviewed, discussed in interviews and checked against the requirements out of the monitoring plan in the registered PDD.</p>
Findings	<p>The amount of electricity transmitted to the grid is continuously measured by export main meters (M1, M3 and M5). Each data from these 3 main meters simultaneously is transferred to the central control system of K-water which is PP's ERP system and KPX. The measured data is collected daily, weekly and monthly and is archived in electronic way. The amount of electricity transmitted was double checked by K-water and KPX then it is confirmed as electricity transmitted to the grid from the project activity. Finally, it is confirmed through monthly sales receipts issued by KPX. Each data of export sub-meters (M2, M4 and M6) is back-up for the preparedness of malfunctioning of the main meters. The verification team checked that these three sub meters were not used during this monitoring period by comparison between two relevant data, daily electricity sales downloaded from the KPX e-power market system and daily exported electricity data measured by each meters (M2, M4, M6) and archived in central control system of K-water. The verification team found that data of electricity transmitted to the grid is consistent with the MR.</p> <p>The amount of electricity imported from the grid is continuously measured by import meters (M7, M8, M9) and import sub meter (M10). Each data from 4 imported meters is transferred to KEPCO. These 4 meters are controlled by KEPCO. The amount of imported electricity from the grid was double checked against receipts of sales issued by KEPCO.</p>
Conclusion	KFQ confirms that the Net amount of electricity transmitted to the grid excluding electricity consumed in the plant has been monitored and updated in accordance with the monitoring plan and the applied methodology ACM0002 (Version 17). Also the verification team confirms this parameter was applied correctly in the baseline emission calculation during the monitoring period as per the monitoring plan and the applied methodology.

Data/Parameter	$EF_{grid,CM,y}$
Data Unit	tCO ₂ /MWh
Description	Combined margin CO ₂ emission factor for the project electricity system in year y
Source of data used	2015, 2016, 2017 Statistics of Electric Power in Korea (2016, 2017, 2018) (KEPCO) and "2017 Status of Generation Facility (2018)" (KPX).
Value(s)	0.5197
Means of verification	The verification team check whether tCO ₂ emission factor of the Korea grid is calculated correctly according to the methodology, ACM0002 (Version 17).
Findings	<p>This value was calculated as a weighted sum of the OM and BM emission factor according to the methodology, ACM0002 (Version 17). According to the methodology, ACM0002 (Version 17), the calculation of the baseline emission factor, $EF_{grid,CM,y}$ justified as below.</p> $EF_{grid,CM,y} = w_{OM} \times EF_{grid,OM,y} + w_{BM} \times EF_{grid,BM,y}$ <p>The weights w_{OM} and w_{BM} by default are 25% and 75% respectively according to the applied methodology and the calculation result is 0.5197 tCO₂/MWh</p> $0.5197 \text{ tCO}_2/\text{MWh} = 0.25 \times 0.7043 \text{ tCO}_2/\text{MWh} + 0.75 \times 0.4582 \text{ tCO}_2/\text{MWh}$ <p>The verification team checked the value of CM and found it is consistent with the registered PDD. This value was calculated according to the "Tool to calculate the emission factor for an electricity system" (version 06.0). The applied value was derived from "2015, 2016, 2017 Statistics of Electric Power in Korea (2016, 2017, 2018)" (KEPCO) and "2017 Status of Generation Facility (2018)" (KPX).</p>
Conclusion	The verification team confirmed that the PP has applied the parameter fixed ante adequately in calculating the GHG emission reductions according to the registered PDD (version 04.0)

E.6.3. Implementation of sampling plan

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

E.7. Compliance with the calibration frequency requirements for measuring instrumentsGeneral statement

Means of verification	The means of verification in relation to the specific instruments are stated in detail in the tables further below.
Findings	During the verification, KFQ found that the PP directly calibrated the watt-hour meter for exportation on 04/10/2018. The findings in relation to the specific instruments are stated in detail in the tables further below.
Conclusion	KFQ confirms that the calibration of the measuring equipment has been conducted as per the national law, applied methodology and the monitoring plan in the registered PDD. KFQ confirms, that there has not been any calibration delay for any instrument affecting the verification period and thus, there is no error to be applied on any monitored parameters.

The table of the CDM-VCR-FORM has been used for the assessment, following rows as needed have been added: Data/Parameter, Data Unit, Description, I.D / Serial Number, Type, Accuracy level, Calibration entity, Calibration frequency, Previous calibration (when applicable), Latest calibration, Applied period of max. permissible error (when applicable). Some parameters involve several instruments, table rows have been added as needed accordingly.

Data/Parameter	EGPJ,y			
Data Unit	MWh			
Description	Net amount of electricity transmitted to the grid excluding electricity consumed			
I.D / Serial Number	Main-meter for electricity exported			
	I.D	M1	M3	M5
	Serial number	PT-0909A408-01	PT-0909A407-01	PT-0909A409-01
Type	Watt-hour meter (Main-meter)			
Accuracy level	± 0.2%			
Calibration entity	Test Entity: Korea Water Resources Corporation(K-water) Supervisor: Korea Power Exchange(KPX)			
Calibration frequency	within 3.5 years ± 6 months			
Previous calibration	11/10/2016 (Validity 10/10/2018)			
Latest calibration	04/10/2018 (Validity 03/10/2022)			
Applied period of max. permissible error	N/A			
Means of verification	The KFQ verification team has visually checked the physical existence of the meters. We checked the calibration records & meter history against the calibration requirements as per the applied methodology, the monitoring plan in the registered PDD as well as the available instrument specifications.			
Findings	The verification team identified that the calibration frequency of the main meters changed from two to four years during this monitoring period. According to the registered PDD, PP has to follow national law for electricity meter calibration. Previously, calibration frequency of electricity meters for export was every 2 years but PP revised it as to follow regarded national law and it was approved through PRC-0349-004 on 04/01/2019. Thus, PP applied 3.5 years ± 6 months of calibration frequency according to the national law. However, calibration frequency in section C of MR version 1.0 is indicated as every 2 years which is not consistent with other parts of the MR. (Refer to Appendix 4 / Table 3 / CAR ID 03) . After PP submitted MR version 2.0, PP indicated calibration frequency correctly as below;			

	Before 04/10/2018	After 04/10/2018	Reason												
	Every 2 years	Within 3.5 years \pm 6 months: according to the national law of electricity meter (Rules on the Operation of the Electricity Market)	PRC of monitoring plan- calibration frequency of electricity meters for export												
	<p>In the course of PRC of monitoring plan, especially for the calibration frequency of electricity meters for export, calibration has to be done according to the national law. As per the Rules on the Operation of the Electricity Market, frequency of calibration is within 3.5 years \pm 6 months. Thus PP applies within 3.5 years \pm 6 months since the first calibration (04/10/2018) within second crediting period.</p> <p>The verification team confirmed that the tests conducted by the PP were in accordance with the direct testing standard for electric power meters for electric power trading in Article 10 of the Rules on the Operation of the Electricity Market. According to the Korean national law (Rules on the Operation of the Electricity Market), when the PP directly calibrates the meter, the supervisor of KPX must participate in the process and check the contents of the test. The above calibration test was conducted under the supervision of KPX. We reviewed the documentation that the PP requested KPX to participate in the above process and result of it was identified through KPX e-power market system. In this system, the verification team checked serial number of each main meters for electricity export, calibration date, calibration result and person participated in calibration.</p> <p>It was found that the instrument, a stated in the MR, physically exists and could be identified by serial number. It was found that the instrument has been calibrated regularly and as per the defined requirements. No delay of calibration has been observed. It was found, that the instrument had a valid calibration covering the whole verification period (01/07/2018~31/12/2018) and was working within the specified error ranges as per available, suitable certificates.</p>														
Conclusion	<p>KFQ confirms that the calibration has been conducted as per the calibration frequency requirements and that the equipment used for monitoring is controlled and calibrated in accordance with the monitoring plan, the applied methodology and the national law.</p> <p>KFQ confirmed that the issue raised above was accurately described in the revised MR (Version 02.0).</p> <p>The CAR (ID 03) has been completely resolved.</p>														
I.D / Serial Number	<table border="1"> <tr> <th colspan="4">Sub-meter for electricity exported</th></tr> <tr> <th>I.D</th><th>M2</th><th>M4</th><th>M6</th></tr> <tr> <td>Serial number</td><td>53048163</td><td>53048164</td><td>53048162</td></tr> </table>			Sub-meter for electricity exported				I.D	M2	M4	M6	Serial number	53048163	53048164	53048162
Sub-meter for electricity exported															
I.D	M2	M4	M6												
Serial number	53048163	53048164	53048162												
Type	Watt-hour meter (Sub-meter)														
Accuracy level	$\pm 0.5\%$														
Calibration entity	Test Entity: Korea Water Resources Corporation(K-water) Supervisor: Korea Power Exchange(KPX)														
Calibration frequency	within 3.5 years \pm 6 months														
Previous calibration	11/10/2016 (Validity 10/10/2018)														
Latest calibration	04/10/2018 (Validity 03/10/2022)														
Applied period of max. permissible error	N/A														
Means of verification	The KFQ verification team has visually checked the physical existence of the meters. We checked the calibration records & meter history against the calibration requirements as per the applied methodology, the monitoring plan in the registered PDD as well as the available instrument specifications.														

Findings	<p>The verification team identified that the calibration frequency of the main meters changed from two to four years during this monitoring period. According to the registered PDD, PP has to follow national law for electricity meter calibration. Previously, calibration frequency of electricity meters for export was every 2 years but PP revised it as to follow regarded national law and it was approved through PRC-0349-004 on 04/01/2019. Thus, PP applied 3.5 years \pm 6 months of calibration frequency according to the national law. However, calibration frequency in section C of MR version 1.0 is indicated as every 2 years which is not consistent with other parts of the MR. (Refer to Appendix 4 / Table 3 / CAR ID 03). After PP submitted MR version 2.0, PP indicated calibration frequency correctly as below;</p> <table border="1"> <thead> <tr> <th>Before 04/10/2018</th><th>After 04/10/2018</th><th>Reason</th></tr> </thead> <tbody> <tr> <td>Every 2 years</td><td>Within 3.5 years \pm 6 months: according to the national law of electricity meter (Rules on the Operation of the Electricity Market)</td><td>PRC of monitoring plan- calibration frequency of electricity meters for export</td></tr> </tbody> </table> <p>In the course of PRC of monitoring plan, especially for the calibration frequency of electricity meters for export, calibration has to be done according to the national law. As per the Rules on the Operation of the Electricity Market, frequency of calibration is within 3.5 years \pm 6 months. Thus PP applies within 3.5 years \pm 6 months since the first calibration (04/10/2018) within second crediting period.</p> <p>The verification team confirmed that the tests conducted by the PP were in accordance with the direct testing standard for electric power meters for electric power trading in Article 10 of the Rules on the Operation of the Electricity Market. According to the Korean national law (Rules on the Operation of the Electricity Market), when the PP directly calibrates the meter, the supervisor of KPX must participate in the process and check the contents of the test. The above calibration test was conducted under the supervision of KPX. We reviewed the documentation that the PP requested KPX to participate in the above process and result of it was identified through KPX e-power market system. In this system, serial number of each main meters for electricity export, calibration date, calibration result and person participated in calibration.</p> <p>It was found that the instrument, a stated in the MR, physically exists and could be identified by serial number. It was found that the instrument has been calibrated regularly and as per the defined requirements. No delay of calibration has been observed. It was found, that the instrument had a valid calibration covering the whole verification period (01/07/2018~31/12/2018) and was working within the specified error ranges as per available, suitable certificates.</p>	Before 04/10/2018	After 04/10/2018	Reason	Every 2 years	Within 3.5 years \pm 6 months: according to the national law of electricity meter (Rules on the Operation of the Electricity Market)	PRC of monitoring plan- calibration frequency of electricity meters for export						
Before 04/10/2018	After 04/10/2018	Reason											
Every 2 years	Within 3.5 years \pm 6 months: according to the national law of electricity meter (Rules on the Operation of the Electricity Market)	PRC of monitoring plan- calibration frequency of electricity meters for export											
Conclusion	<p>KFQ confirms that the calibration has been conducted as per the calibration frequency requirements and that the equipment used for monitoring is controlled and calibrated in accordance with the monitoring plan, the applied methodology and the national law.</p> <p>KFQ confirmed that the issue raised above was accurately described in the revised MR (Version 02.0). The raised CAR (ID 03) has been completely resolved.</p>												
I.D / Serial Number	<table border="1"> <thead> <tr> <th colspan="4">Main-meter for electricity imported</th></tr> <tr> <th>I.D</th><th>M7</th><th>M8</th><th>M9</th></tr> </thead> <tbody> <tr> <td>Serial number</td><td>8175017820</td><td>8175017821</td><td>8175017822</td></tr> </tbody> </table>	Main-meter for electricity imported				I.D	M7	M8	M9	Serial number	8175017820	8175017821	8175017822
Main-meter for electricity imported													
I.D	M7	M8	M9										
Serial number	8175017820	8175017821	8175017822										
Type	Watt-hour meter (Main-meter)												
Accuracy level	$\pm 0.5\%$												
Calibration entity	Korea Testing Certification Co., Ltd.												
Calibration frequency	<p>Every 7 years</p> <p>※ According to the national law for electricity meter for import (Enforcement Decree of The Measures Act), meters shall be recalibrated by KEPCO every 7 years but calibration validity is counted from first day of the next month of calibration was</p>												

	conducted.(i.e. In case of calibration was conducted on 17/11/2010, validity of it is 01/12/2010~30/11/2017).						
Previous calibration	22/10/2010 (Validity 31/10/2017)						
Latest calibration	04/04/2017 (Validity 30/04/2024)						
Applied period of max. permissible error	N/A						
Means of verification	The KFQ verification team has visually checked the physical existence of the meters. The KFQ validation team has checked the calibration records & meter history against the calibration requirements as per the applied methodology, the monitoring plan in the registered PDD as well as the available instrument specifications.						
Findings	It was found that the instrument, a stated in the MR, physically exists and could be identified by serial number. It was found that the instrument has been calibrated regularly and as per the defined requirements. No delay of calibration has been observed. In addition, we have cross-checked the KOLAS certificate confirming that the qualification of the testing laboratory of 'Korea Testing Certification Co., Ltd.' is valid on the test date of the calibration report (04/04/2017). It was found, that the instrument had a valid calibration covering the whole verification period (01/07/2018~31/12/2018) and was working within the specified error ranges as per available, suitable certificates.						
Conclusion	KFQ confirms that the calibration has been conducted as per the calibration frequency requirements and that the equipment used for monitoring is controlled and calibrated in accordance with the monitoring plan and the applied methodology.						
I.D / Serial Number	<table border="1"> <tr> <th colspan="2">Sub-meter for electricity imported</th></tr> <tr> <td>I.D</td><td>M10</td></tr> <tr> <td>Serial number</td><td>25162020294</td></tr> </table>	Sub-meter for electricity imported		I.D	M10	Serial number	25162020294
Sub-meter for electricity imported							
I.D	M10						
Serial number	25162020294						
Type	Watt-hour meter (Sub-meter)						
Accuracy level	±0.5%						
Calibration entity	Korea Testing Certification Co., Ltd.						
Calibration frequency	Every 7 years ※ According to the national law for electricity meter for import (Enforcement Decree of The Measures Act), meters shall be recalibrated by KEPCO every 7 years but calibration validity is counted from first day of the next month of calibration was conducted.(i.e. In case of calibration was conducted on 17/11/2010, validity of it is 01/12/2010~30/11/2017).						
Previous calibration	17/11/2010 (Validity 30/11/2017)						
Latest calibration	08/12/2016 (Validity 31/12/2023)						
Applied period of max. permissible error	N/A						
Means of verification	The KFQ verification team has visually checked the physical existence of the meters. The KFQ validation team has checked the calibration records & meter history against the calibration requirements as per the applied methodology, the monitoring plan in the registered PDD as well as the available instrument specifications.						
Findings	The KFQ verification team has visually checked the physical existence of the meters. In addition, we have cross-checked the KOLAS certificate confirming that the qualification of the testing laboratory of 'Korea Testing Certification Co., Ltd.' is valid on the issue date of the test report (09/12/2016). The KFQ validation team has checked the calibration records & meter history against the calibration requirements as per the applied methodology, the monitoring plan in the registered PDD as well as the available instrument specifications.						
Conclusion	It was found that the instrument, a stated in the MR, physically exists and could be identified by serial number. It was found that the instrument has been calibrated regularly and as per the defined requirements. No delay of calibration has been observed. It was found, that the instrument had a valid calibration covering the whole verification period (01/07/2018~31/12/2018) and was working within the specified error ranges as per available, suitable certificates.						

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	<p>The KFQ verification team has reviewed all data, parameters and formulae with respect to calculation of the baseline GHG emissions and checked them against the requirements out of the applied methodology ACM0002 (Version 17) and the PDD as well as relevant tools applied.</p> <p>KFQ has also assessed the completeness, quality and appropriateness of the data, parameters and calculations.</p> <p>Furthermore, KFQ has assessed, whether any assumptions, emission factors, default values, GWPs or other reference values – as applicable – used by the PP have been justified and correctly applied, in line with the requirements.</p> <p>KFQ has further crosschecked – as applicable - any information with other sources available such as but not limited to the data from KPX, electricity bills from KEPCO, etc.</p>												
Findings	<p>The baseline GHG emissions have been found to be 124,388 tCO₂e for the verification period. It was found that a complete set of data covering the monitoring period has been provided by the PP. Activity levels and non-activity (ex-ante) parameter have been monitored in accordance with the monitoring plan in the registered PDD, as applicable.</p> <p>The calculation was found to be correct as well as carried out in accordance with the formulae and methods described in the monitoring methodology ACM0002 (Version 17) and the registered PDD.</p> <p>It was found that all emission factors and default values and reference values, as applicable, have been correctly justified, are explicitly mentioned in the MR and have been correctly applied. It was found that no assumptions are used that have any relevant influence on reported emission reductions.</p> <p>It was found that 'the data of electricity exported to KEPCO grid' were daily transferred to central control system of K-water and the collected data of K-water was cross-checked with the data of KPX. 'The data of electricity imported from KEPCO grid' were monthly checked by receipt of KEPCO. It is checked that there were no errors in the transfer of data for the calculation of emissions reductions. KFQ confirms that rounding of digits has been applied both correctly and conservatively.</p> <p>It was found that the spreadsheets, were made available completely by the PP and that all formulae have been correctly implemented and are accessible and traceable. Safeguarding procedures in accordance to the monitoring plan have been applied in a conservative way. Rounding of digits, where applicable, has been applied both correctly and conservatively.</p> <p>All necessary documentation is collected, referenced and aggregated and is easily accessible in spreadsheets and daily reports in electronic format. Measurements are performed by proper Watt-hour meters, and key data could be cross-checked via other sources (if applicable). Further details on cross-checks for each parameter and the information flow are given in sections E.6.2 above.</p> <p>A detailed assessment of all relevant parameters for the verification period is given in E.6.1 and E.6.2 above.</p> <p>However, monitoring period in section E.1 of the MR version 1.0 is not consistent with this monitoring period. In addition, we found expression of factors involved in BE, PE and LE calculation are inconsistency with the registered PDD as below <u>(Refer to Appendix 4 / Table 2 / CL ID 01)</u>.</p> <table><tr><th>Section</th><th>PDD (Version 04.0)</th><th>MR (Version 01.0)</th></tr><tr><td>E.1.</td><td>$BE_y=EG_{PJ,y} \times EF_{grid,y}$</td><td>$BE_y=EG^*_y \times EF_y$</td></tr><tr><td>E.2.</td><td>PE_y</td><td>PE</td></tr><tr><td>E.3.-4.</td><td>LE_y</td><td>L or L_y</td></tr></table> <p>PP revised that the MR (Version 02.0) and corrected typo and expressions mentioned above as per the applied methodology in the registered PDD.</p>	Section	PDD (Version 04.0)	MR (Version 01.0)	E.1.	$BE_y=EG_{PJ,y} \times EF_{grid,y}$	$BE_y=EG^*_y \times EF_y$	E.2.	PE_y	PE	E.3.-4.	LE_y	L or L_y
Section	PDD (Version 04.0)	MR (Version 01.0)											
E.1.	$BE_y=EG_{PJ,y} \times EF_{grid,y}$	$BE_y=EG^*_y \times EF_y$											
E.2.	PE_y	PE											
E.3.-4.	LE_y	L or L_y											
Conclusion	<p>KFQ confirms that all required data for calculation of the baseline GHG emissions were available for the whole verification period.</p>												

	<p>KFQ confirms that suitable cross-checking of data was possible and has been performed as described.</p> <p>KFQ confirms that the PP has followed appropriate methods and formulae for calculating baseline GHG emissions have been followed.</p> <p>KFQ confirms that any emission factors, default values and reference values– as applicable – that were applied in the calculation have been justified and correctly applied. No assumptions were used.</p> <p>KFQ confirms that the calculation of the baseline GHG emissions for the covered monitoring period is fully complete and based on suitable and verifiable evidence.</p> <p>The raised CL (ID 01) has been completely resolved.</p>
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E.8.2. Calculation of project GHG emissions or actual net anthropogenic GHG removals by sinks

Means of verification	KFQ has checked, whether project GHG emissions (if any) were determined by the PP is in accordance with the applied methodology and the monitoring plan in the registered PDD.
Findings	For most renewable energy project activities, $PE_y=0$ according to the methodology, ACM0002 Version 17.
Conclusion	KFQ confirms that the PP approach with regard to project GHG emissions is correct and that no project GHG emissions need to be considered in the project based on the applied methodology.

E.8.3. Calculation of leakage GHG emissions

Means of verification	KFQ has checked, whether leakage emissions (if any) were determined by the PP in accordance with the applied methodology and the monitoring plan in the registered PDD.
Findings	KFQ has found that the approach applied by the PP that leakage emissions need not to be considered (i.e. being considered zero, consequently) is in accordance to the applied methodology ACM0002 (Version 17).
Conclusion	KFQ confirms that the PP approaches with regard to leakage GHG emissions is correct and that no leakage GHG emissions need to be considered in the project based on the applied methodology.

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

Means of verification	<p>KFQ has reviewed all data, parameters and formulae with respect to calculation of the baseline GHG emissions and checked them against the requirements out of the applied methodology ACM0002. (Version 17.0) and the registered PDD as well as relevant tools applied.</p> <p>KFQ has also assessed the completeness, quality and appropriateness of the data, parameters and calculations.</p> <p>Furthermore, KFQ has assessed, whether any assumptions, emission factors, default values, GWPs or other reference values – as applicable – used by the PP have been justified and correctly applied, in line with the requirements.</p> <p>KFQ has further crosschecked – as applicable - any information with other sources available such as but not limited to the data from KPX, electricity bills from KEPCO, etc.</p> <p>Means of verification in respect of baseline GHG emissions, project GHG emissions and leakage GHG emissions that form the basis for calculation of the GHG emission reductions, are stated in detail in sections E.8.1., E.8.2. and E.8.3. above.</p>
Findings	<p>The GHG emission reductions have been found to be 124,388 tCO₂e for the verification period.</p> <p>It was found that a complete set of data covering the monitoring period has been provided by the PP. Activity levels and non-activity (ex-ante) parameter have been monitored in accordance with the monitoring plan in the registered PDD, as applicable.</p>

	<p>The calculation was found to be correct as well as carried out in accordance with the formulae and methods described in the monitoring methodology ACM0002. (Version 17) and the registered PDD.</p> <p>It was found that all emission factors and default values and reference values, as applicable, have been correctly justified, are explicitly mentioned in the MR and have been correctly applied. It was found that no assumptions are used that have any relevant influence on reported emission reductions.</p> <p>It was found that 'the data of electricity imported from KEPCO grid' were daily transferred to central control system of K-water and the collected data of K-water was cross-checked with the data of KPX. 'The data of electricity exported to KEPCO grid' were monthly checked by receipt of KEPCO. It is checked that there were no errors in the transfer of data for the calculation of emissions reductions. KFQ confirms that rounding of digits has been applied both correctly and conservatively.</p> <p>It was found that no re-calculations of raw data are applied during this monitoring period.</p> <p>And it was found that the spreadsheets were made available completely by the PP and that all formulae have been correctly implemented and are accessible and traceable according to the registered PDD. Safeguarding procedures in accordance to the monitoring plan have been applied in a conservative way. Rounding of digits, where applicable, has been applied both correctly and conservatively.</p> <p>All necessary documentation is collected, referenced and aggregated and is easily accessible in spreadsheets and daily reports in electronic format. Measurements are performed by proper Watt-hour meters, and key data could be cross-checked via other sources (if applicable). Further details on cross-checks for each parameter and the information flow are given in sections E.6.2 above.</p> <p>A detailed assessment of all relevant parameters for the verification period is given in E.6.1 and E.6.2 above.</p>
Conclusion	<p>KFQ confirms that all data set required for calculation of the baseline GHG emissions were obtained for the whole verification period and no data were missing of any non-monitoring of activity levels or non-activity parameters.</p> <p>KFQ confirms that suitable cross-checking of data was possible and has been performed as described.</p> <p>KFQ confirms that the PP have followed appropriate methods and formulae for calculating GHG emission reductions have been followed.</p> <p>KFQ confirms that any emission factors, GWPs and default values and reference values – as applicable – that were applied in the calculation have been justified and correctly applied. No assumptions were used.</p> <p>KFQ confirms that the calculation of the GHG emission for the covered monitoring period is fully complete and based on suitable and verifiable evidence.</p>

E.8.5. Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Means of verification	<p>KFQ compared the ex-ante estimation of emission reductions in the registered PDD (Version 04.0) with the emission reductions reported by the PP in the MR. Furthermore, the value, especially the electricity exported to the Grid applied in the estimation of emission reductions in the registered PDD were reviewed.</p>
Findings	<p>The ex-ante estimation for year 2018 in the PDD is 251,089 tCO_{2e} and it corresponds to 126,576 tCO_{2e} during the 184 days (01/07/2018 to 31/12/2018) of the verification period. The actual emission reductions reported by the PP during the same period was 124,388 tCO_{2e} and is thus lower than the value estimated in the PDD.</p> <p>We identified that the difference between tide and ebb tide caused by the Earth's rotation is influenced by the astronomical principle of the 'Nutation Period' (18.6 years) through on-site inspection. According to the staff in charge of the generator operation, this is the period from 2018 when the tide is lowered by the above principle. Therefore, it is estimated that the actual power generation is reduced compared to the power generation planned by the PP. It is difficult to ascertain exactly how much difference is scientifically generated.</p> <p>It was found that the PP has correctly described the situation in the MR as well.</p>

Conclusion	<p>KFQ confirms the reported emission reductions in the MR (Version 02) decreased by 1.8% compared to the ex-ante estimation of emission reductions in the registered PDD.</p> <p>KFQ confirms that the emission reductions claimed by the PP are reasonable.</p>
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E.8.6. Remarks on difference from estimated value in registered PDD

Means of verification	As per the specific instructions of the CDM-VCR-FORM, in this section it is to be explained how the cause of any increase in the actual GHG emission reductions in this monitoring period were assessed in accordance with the applicable verification requirements in the VVS. As determined in section E.8.5 above, the emission reductions of the project activity during the verification period are lower than emissions reductions estimated ex-ante in the PDD, KFQ has checked the respective explanation offered by the PP in the monitoring period.
Findings	<p>The reported emission reductions in the MR (Version 02.0) are lower than the ex-ante estimation in the registered PDD. The main reason is that the amount of power generation is decreasing as unexpected tidal difference activity according to astronomical principles as described above.</p> <p>Actual net amount of electricity transmitted to the grid (239,346 MWh) is smaller the registered PDD (255,901 MWh) for the same period.</p>
Conclusion	<p>KFQ confirms that the difference between the actual GHG emissions reductions and the estimated value were well justified during the verification period.</p> <p>KFQ confirms that the emission reductions claimed by the PP are reliable.</p>

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 GHG emission reductions reported in the MR are 124,388 tCO ₂ e. As described in detail in Section E of this report, all relevant aspects of the project activity have been assessed in order to determine, whether the claimed emission reductions by the PP are correctly determined, reasonable and fairly stated and based on verifiable evidence and in accordance with the applied methodology and the registered PDD.
Findings	It was found that the project activity is implemented and operated according to the registered PDD. The monitoring of any and all data and parameters as well as calculation of baseline GHG emissions, project GHG emissions and GHG emission reductions is complete conducted in accordance with the registered PDD, the applied methodology.
Conclusion	KFQ arrived at the conclusion that the GHG emission reductions reported in the MR and claimed by the PP is correctly determined with 124,388 tCO ₂ e for the covered verification period between 01/07/2018 to 31/12/2018. This implies, that 100% of the reported GHG emission reduction in this verification period has been achieved in a period after the end of 31/12/2012. i.e. the first commitment period is untouched by this verification period.

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

Means of verification	The PP has neither developed sustainable development co-benefits nor monitored sustainable development co-benefits of the project activity, the section is therefore not applicable in this verification period.
Findings	N/A
Conclusion	N/A

E.10. Global stakeholder consultation

Means of verification	There were no comments received with regard to the stakeholder consultation conducted after the publication of the first MR in accordance with the "CDM project cycle procedure for project activities", the section is therefore no applicable in this verification period.
Findings	N/A

Conclusion	N/A
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SECTION F. Internal quality control

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According to KFQ's Procedure for deciding whether to proceed request for issuance, the final verification report and verification findings underwent a technical review before being submitted to the project participant for requesting issuance CERs. The technical review was performed by technical review team composed of a person qualified for this project activity in accordance with KFQ's qualification scheme for CDM project validation and verification.

SECTION G. Verification opinion

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Through the verification for the monitoring report of the CDM project activity: "Sihwa Tidal Power Plant CDM Project" in accordance with VVS (Version 02.0), KFQ could confirm that:

- The project activity has been implemented and operated as per the registered PDD (Version 04.0, 20/09/2018),
- The installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately,
- The monitoring plan in the registered PDD is as per the applied methodology,
- The monitoring plan in the monitoring report is as per the registered PDD,
- The monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan, and approved methodology including applicable tool(s) and generated GHG emission reductions data,
- The GHG emission reductions in the monitoring report (Version 02) are calculated without material misstatements.

KFQ's verification opinion refers to the project's GHG emissions and resulting GHG emission reductions reported both determined due to the valid and registered project's baseline, its monitoring plan and its associated documents.

Based on the information we have seen and evaluated, we confirm the followings:

Project Title	Sihwa Tidal Power Plant CDM Project
UNFCCC Reference Number	0349
Date of registration	18 June 2006
Date of crediting period renewal	4 January 2019
Registered PDD	20/09/2018 (Version 04.0)
Methodology applied	ACM0002 (Version 17)
Final Version of Monitoring Report	02 (07/06/2019)
2 nd Crediting period (1 st Crediting period)	01/07/2018 to 30/06/2025 (01/07/2011 to 30/06/2018)
Monitoring period	01/07/2018 to 31/12/2018
Total GHG emission Reductions Verified	Baseline emissions: 124,388 tonnes CO _{2e} Project emissions: 0 tonnes CO _{2e} Leakage: 0 tonnes CO _{2e} Emission reductions: <u>124,388 tonnes CO_{2e}</u>

It is the opinion of KFQ that the amount of GHG emission reductions achieved by the project activity during this monitoring period is correct and that complies with all applicable CDM requirements.

SECTION H. Certification statement

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Korean Foundation for Quality has performed the periodic verification of the emission reductions that have been reported for the CDM project activity: "Sihwa Tidal Power Plant CDM Project" (UNFCCC Registration Ref. No. 0349) for the period from 01 July 2018 to 31 December 2018.

The project participant are responsible for the collection of data in accordance with the monitoring plan in the registered PDD and the reporting of GHG emissions reductions from the project. It is KFQ's responsibility to express an independent verification statement on the reported GHG emission reductions from the project.

KFQ conducted the verification on the basis of the monitoring methodology ACM0002 (Version 17), the registered Project Design Document of 20/09/2018 (Version 04.0), the validation report (dated 28/02/2006, Rev. 03), validation opinion on renewal of crediting period (dated on 20/10/2018), approval of UNFCCC on the renewal (dated on 04/01/2019) and the monitoring report (Version 02) dated 07/06/2019. The verification included i) checking whether the provisions of the monitoring methodology and the monitoring plan were consistently and appropriately applied and ii) the collection of evidence supporting the reported data.

KFQ's verification approach draws on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. KFQ planned and performed the verification by obtaining evidence and other information and explanations that KFQ considers necessary to give reasonable assurance on the reported GHG emission reductions.

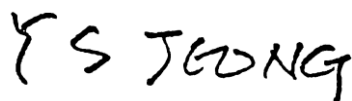
In our opinion the GHG emissions reductions of the "Sihwa Tidal Power Plant CDM Project" (UNFCCC Registration Ref. No. 0349) for the period from 01 July 2018 to 31 December 2018 are fairly stated in the monitoring report (Version 02).

The data generation, aggregation, recording, calculation and reporting of GHG emission reductions were conducted correctly on the basis of the approved baseline and monitoring methodology ACM0002 (Version 17) and the monitoring plan contained in the registered PDD.

Hence, KFQ is able to certify that the emission reductions of the "Sihwa Tidal Power Plant CDM Project" during the period 01 July 2018 to 31 December 2018 are 124,388 tons of CO₂ equivalent.

Signed on behalf of the Korean Foundation for Quality

Signature :



Name : Yu Shim JEONG, Managing Director

Date : 12 June 2019

Appendix 1. Abbreviations

Abbreviations	Full texts
ACM	Approved Consolidated Methodology
AM	Approved Methodology
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction(s)
CL	Clarification Request
CM	Combined Margin
CMP	COP/MOP Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO ₂	Carbon dioxide
CO _{2e}	Carbon dioxide equivalent
DOE	Designated Operational Entity
EB	Executive Board
EF	CO ₂ emission factor
EMS	Environment Management System
ERP	Enterprise Resource Planning
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
KEPCO	Korea Electric Power Corporation
KFQ	Korean Foundation for Quality
KPX	Korea Power Exchange
K-water	Korea Water Resources Corporation
MoV	Means of verification
MP	Monitoring Plan
MR	Monitoring Report
OM	Operating Margin
PDD	Project Design Document
PP	Project participant
PS	Clean Development Mechanism Project Standard
PRC	Post-Registration Change
QMS	Quality Management System
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Clean Development Mechanism Validation and Verification Standard

Appendix 2. Competence of team members and technical reviewers



CERTIFICATE OF COMPETENCE

Name: Su Hyun PARK

Qualification:

	Validation	Verification
-Lead auditor	<input type="checkbox"/>	<input type="checkbox"/>
-Auditor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
-Technical Expert	<input type="checkbox"/>	<input type="checkbox"/>
-Local Expert	<input type="checkbox"/>	<input type="checkbox"/>

Scopes of Expertise:

Technical Area (TA)

1.2 Renewables

She is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 11 January 2018

Sustainability Management Institute
Mi Jung LEE



CERTIFICATE OF COMPETENCE

Name: Mi Jung LEE

Qualification:

	Validation	Verification
-Lead auditor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
-Auditor	<input type="checkbox"/>	<input type="checkbox"/>
-Technical Expert	<input type="checkbox"/>	<input type="checkbox"/>
-Local Expert	<input type="checkbox"/>	<input type="checkbox"/>

Scopes of Expertise:

Technical Area (TA)

- 1.1 Thermal energy generation
- 1.2 Renewables
- 3.1 Energy demand
- 5.2 Caprolactam, nitric and adipic acid
- 11.1 Emission of Fluorinated gases
- 11.2 Refrigerant gas production
- 13.1 Solid waste and wastewater
- 13.2 Manure

She is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 14 September 2017.

Sustainability Management Institute
Yu Shim JEONG



CERTIFICATE OF COMPETENCE

Name: Pyung-Hee JANG

Qualification:

	Validation	Verification
-Lead auditor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
-Auditor	<input type="checkbox"/>	<input type="checkbox"/>
-Technical Expert	<input type="checkbox"/>	<input type="checkbox"/>
-Local Expert	<input type="checkbox"/>	<input type="checkbox"/>

Scopes of Expertise:

Technical Area (TA)

- 1.1 Thermal energy generation
- 1.2 Renewables

He is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 31 March 2016.

Sustainability Management Institute
Sang Yeon PARK



CERTIFICATE OF COMPETENCE

Name: Sung Sam MOON

Qualification:

	Validation	Verification
-Lead auditor	<input type="checkbox"/>	<input type="checkbox"/>
-Auditor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
-Technical Expert	<input type="checkbox"/>	<input type="checkbox"/>
-Local Expert	<input type="checkbox"/>	<input type="checkbox"/>

Scopes of Expertise:

Technical Area (TA)

1.2 Renewables

He is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 12 March 2019

Sustainability Management Institute
Mi Jung Lee



CERTIFICATE OF COMPETENCE

Name: Yeong Gyeong KANG

Qualification:

	Validation	Verification
-Lead auditor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
-Auditor	<input type="checkbox"/>	<input type="checkbox"/>
-Technical Expert	<input type="checkbox"/>	<input type="checkbox"/>
-Local Expert	<input type="checkbox"/>	<input type="checkbox"/>

Scopes of Expertise:

Technical Area (TA)

1.2 Renewables

13.1 Solid Waste and wastewater

She is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 02 January 2019.

Sustainability Management Institute
Mi Jung LEE

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1	Project participant	Monitoring report	Version 01 (05/04/2019) Version 02 (07/06/2019)	Project participant
2	Project participant	The emission reduction calculations (spread sheet)	Version 01 (05/04/2019)	Project participant
3	Project participant	CDM Project Design Document (Version 04.0)	20/09/2018 Published under https://cdm.unfccc.int/Projects/DB/DNV-CUK1143710269.08/view	Others
4	DNV	CDM Validation Report Report No. 2005-1537 (Revision No. 03)	28/02/2006 Published under https://cdm.unfccc.int/Projects/DB/DNV-CUK1143710269.08/view?cp=1	Others
5	TÜV SÜD South Asia Private Limited	Validation Report for renewal crediting period (Version 5.0)	20/10/2018 Published under https://cdm.unfccc.int/Projects/DB/DNV-CUK1143710269.08/view	Others
6	KTR	Verification and Certification Report for the "Siwha Tidal Power Plant CDM project" for the monitoring period from 01/01/2018 to 30/12/2018 (Version 02.0)	15/02/2019 https://cdm.unfccc.int/Projects/DB/DNV-CUK1143710269.08/iProcess/KTRCert1543903435.29/view	Others
7	KFQ	Validation report for PRC	PRC-0349-005 (01/03/2019)	Others
8	TÜV SÜD	Validation report for PRC	PRC-0349-004 (04/01/2019)	Others
9	KSA	Validation report for PRC	PRC-0349-003 (30/10/2014)	Others
10	KSA	Validation report for PRC	PRC-0349-002 (03/05/2013)	Others
11	KTR	Validation report for PRC	PRC-0349-001 (23/11/2012)	Others
12	Project participant	KPX calibration test participation request materials	16/05/2019	Project participant
13	Project participant	Construction completion report	28/11/2011	Project participant
14	Korea Power Exchange (KPX)	Grid connection approval	13/04/2011	Project participant
15	Project participant	Test run plan	08/03/2011	Project participant
16	Project participant	Start up business notification to the government (Ministry of Knowledge Economy)	06/03/2012	Project participant
17	Project participant	Equipment specification	-	Project participant
18	Project participant	Single line diagram	26/01/2010	Project participant
19	Project participant	Daily power plant operation report	21/08/2018 18/09/2018 - 20/09/2018 17/10/2018 - 19/10/2018 17/11/2018	Project participant
20	Project participant	Power generation time and tidal data (excel)	16/05/2019	Project participant
21	ERP system (central control)	Daily/monthly monitoring reports (excel file)	01/07/2018 ~ 31/12/2018	Project participant

	system of K-water)			
22	Korea Power Exchange (KPX)	KPX hourly/daily exported electricity data from e-power market	01/07/2018 ~ 31/12/2018	Project participant
23	Project participant	Monthly imported electricity data from KEPCO i-SMART	01/07/2018 ~ 31/12/2018	Project participant
24	Korea Electric Power Corporation (KEPCO)	Receipts of sales	01/07/2018 ~ 31/12/2018	Project participant
25	Project participant	Internal Manual in Emergency'	28/02/2019	Project participant
26	Project participant	Sihwa Tidal Power Plant Operation Manual	2011	Project participant
27	Project participant	CDM monitoring manual	25/01/2019	Project participant
28	Project participant	Designation of CDM monitoring personnel	11/03/2019	Project participant
29	Project participant	K-water organization chart (old/new) and Internal letter of revision	05/12/2018	Project participant
30	Project participant	Staff training records -Monitoring & technical training -CDM monitoring and manual training -Operation & technical training	20/07/2018	Project participant
31	Korea Accreditation Board, ISO certification information network	ISO 9001, 14001 Certified	https://www.icin.or.kr/STAT/S_TAT_02_011.aspx	Other
32	Project participant	Calibration reports for meters, M1~M6	04/10/2018 (Latest)	Project participant
32 33	Korea Testing Certification Co., Ltd.		07/11/2016 (Previous)	
34	Korea Testing Certification Co., Ltd.	Calibration reports for meters, M7~M9	25/10/2010, 04/04/2017	Project participant
34	Korea Testing Certification Co., Ltd.	Calibration reports for meter, M10	17/11/2010, 09/12/2016	Project participant
35	Ministry of Trade, Industry and Energy	Enforcement Decree of The Measures Act	Enforced from 01/01/2018 http://www.law.go.kr/engLsS_c.do?tabMenuId=tab45&query=%EA%B3%84%EB%9F%89%EC%97%90%20%EA%B4%80%ED%95%9C%20%EB%B2%95%EB%A5%A0%20%EC%8B%9C%ED%96%89%EB%A0%B9%23#	Others
36	Korea Power Exchange	Rules on the Operation of the Electricity Market	Enforced on 03/08/2018 https://www.kpx.or.kr/www/selectBbsNttView.do?key=29&bbsNo=114&nttNo=17769&searchCtgr=&searchCnd=all&searchKwrd=&pageIndex=1&integrDeptCode=	Others
37	CDM Executive Board	ACM0002 "Grid-connected electricity generation from renewable sources"	Version 17.0 (13/05/2016) Published under:	Others

		<p>Tool07 Methodological Tool: Tool to calculate the emission factor for an electricity system</p> <p>CDM Validation and Verification Standard for project activities</p> <p>CDM Project Standard for project activities</p> <p>CDM project cycle procedure for project activities</p> <p>Guideline on the application of materiality in verifications</p> <p>Checklist for requests for issuance for project activities</p> <p>Monitoring report form</p> <p>Verification and certification report form for CDM project activities</p>	<p>https://cdm.unfccc.int/methodologies/DB/VJI9AX539D9MLOPXN2AY9UR1N4IYGD</p> <p>Version 06.0 (01/11/2017)</p> <p>Published under: https://cdm.unfccc.int/Reference/index.html</p> <p>Version 02.0 (29/11/2018)</p> <p>Version 02.0 (29/11/2018)</p> <p>Version 02.0 (29/11/2018)</p> <p>Version 02.0 (20/02/2015)</p> <p>Version 05.0 (09/06/2017)</p> <p>Version 06.0 (07/06/2017)</p> <p>Version 02.1 (11/01/2018)</p> <p>All published under: https://cdm.unfccc.int/Reference/index.html</p>	
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FAR ID	N/A	Section no.	N/A	Date: N/A
Description of FAR				
N/A				
Project participant response				Date: N/A
N/A				
Documentation provided by project participant				
N/A				
DOE assessment				Date: N/A
N/A				

CL ID	01	Section no.	E.8.	Date: 10/05/2019
Description of CL				
Monitoring period in section E.1 of the MR version 1.0 is not consistent with this monitoring period.				
In addition, we found expression of factors involved in BE, PE and LE calculation are inconsistency with the registered PDD as below:				
Section	PDD (Version 04.0)	MR (Version 01.0)		
E.1.	$BE_y = EG_{PJ,y} \times EF_{grid,y}$	$BE_y = EG_y^* \times EF_y$		
E.2.	PE_y	PE		
E.3.~4.	LE_y	L or L_y		
Project participant response				Date: 0706/2019
PP revised MR (Version 02.0) to indicate correct expression of factors involved in ER calculation according to the registered PDD.				
Documentation provided by project participant				
MR (Version 02.0)				
DOE assessment				Date: 07/06/2019
Verification team checked corrected expression of factors involved in BE, PE and LE calculation and confirmed that PP indicated it as per the registered PDD.				

CAR ID	01	Section no.	E.3.	Date: 10/05/2019
Description of CAR				
In the course of document review, verification team identified that generator #1~#4 didn't work during some days within this monitoring period thus electricity generation was recorded as '0' but exact date of non-operation was not provided in MR version 1.0 and evidence of it was not provided during on-site assessment.				
-21/08/2018, 18/09/2018 - 20/09/2018, 17/10/2018 - 19/10/2018, 17/11/2018				
Project participant response				Date: 07/06/2019
PP revised MR to provide exact date of non-operation of generator #1~#4 and evidence of it was provided to the verification team.				
Documentation provided by project participant				
MR (Version 02.0), Daily operation report, Power generation time and tidal data (excel)				

DOE assessment	Date: 07/06/2019
<p>The verification team checked each case by checking daily operation report of above mentioned dates and interviewing relevant plant staff on the actual operation of the plant. K-water does not open all gates at once to ensure stable generation. When the water level rises, generators # 5~10 are started first, and # 1~4 are running slowly after that. If the flow rate does not reach the constant flow rate, the generator does not work, so that a period in which the power generation amount of the # 1-4 generator recorded as '0'. We checked the tidal data and generation time of 10 generators for the entire monitoring period provided by the PP. We identified the generation time and tidal range for days with a power generation of '0' and those with significantly less power generation than the other periods in the above table.</p> <p>The verification team confirmed that those operational situations described in the monitoring report is correspond to the daily operation report and it was clearly described in the MR (Version 02.0).</p> <p>KFQ confirms that no emissions reductions were claimed for those periods when Sihwa tidal power plant stopped the operation in accordance with the registered PDD, applied methodology and the requirements from VVS. And it is clearly and correctly reflected in the emission reduction calculation spreadsheet.</p>	

CAR ID	02	Section no.	E.5.	Date: 10/05/2019
Description of CAR				
According to the instructions for completing CDM-MR-FORM, methodological tools to which the applied methodology refers has to be indicated in the section A.4 of MR but the applied tool (Tool to calculate the emission factor for an electricity) was not indicated in the section of MR (version 1.0)				
Project participant response				Date: 07/06/2019
PP indicated the exact title, version and UNFCCC reference number of applied methodological tool (Tool 07) which refers applied methodology ACM0002 in the section A.4 of the revised MR (Version 02.0).				
Documentation provided by project participant				
MR (Version 02.0)				
DOE assessment				Date: 07/06/2019
KFQ confirms that PP revised MR version 2.0 to indicate the applied TOOL 07 which is reference to applied methodology ACM 0002 version 17.0.				

CAR ID	03	Section no.	E.7	Date: 10/05/2019						
Description of CAR										
<p>The verification team identified that the calibration frequency of the main meters changed from two to four years during this monitoring period. According to the registered PDD, PP has to follow national law for electricity meter calibration. Previously, calibration frequency of electricity meters for export was every 2 years but PP revised it as to follow regarded national law and it was approved through PRC-0349-004 on 04/01/2019. Thus, PP applied within 3.5 years \pm 6 months of calibration frequency according to the national law. However, calibration frequency in section C of MR version 1.0 is indicated as every 2 years which is not consistent with other parts of the MR.</p>										
Project participant response				Date: 07/06/2019						
After PP submitted MR version 2.0, PP indicated calibration frequency correctly as below;										
<table border="1"> <thead> <tr> <th>Before 04/10/2018</th> <th>After 04/10/2018</th> <th>Reason</th> </tr> </thead> <tbody> <tr> <td>Every 2 years</td> <td>Within 3.5 years \pm 6 months: according to the national law of electricity meter (Rules on the Operation of the Electricity Market)</td> <td>PRC of monitoring plan- calibration frequency of electricity meters for export</td> </tr> </tbody> </table>			Before 04/10/2018	After 04/10/2018	Reason	Every 2 years	Within 3.5 years \pm 6 months: according to the national law of electricity meter (Rules on the Operation of the Electricity Market)	PRC of monitoring plan- calibration frequency of electricity meters for export		
Before 04/10/2018	After 04/10/2018	Reason								
Every 2 years	Within 3.5 years \pm 6 months: according to the national law of electricity meter (Rules on the Operation of the Electricity Market)	PRC of monitoring plan- calibration frequency of electricity meters for export								
Documentation provided by project participant										
MR (Version 02.0)										
DOE assessment				Date: 07/06/2019						
In the course of PRC of monitoring plan, especially for the calibration frequency of electricity meters for export, calibration has to be done according to the national law. As per the Rules on the Operation of the Electricity Market, frequency of calibration is within 3.5 years \pm 6 months. Thus PP applies within 3.5 years \pm 6 months since the first calibration (04/10/2018) within second crediting period. The verification team confirms that calibration frequency of export electricity meter correctly indicated according to the registered PDD version 4.0.										

Table 4. FAR from this verification

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