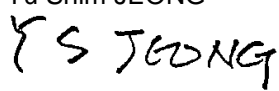




**Verification and certification report form for  
CDM project activities  
(Version 03.0)**

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

**BASIC INFORMATION**

<b>Title and UNFCCC reference number of the project activity</b>	· Title: Reduction of N <sub>2</sub> O emissions from the new nitric acid plant #5 of Hu-Chems Fine Chemical Corp. · Ref. no.: 6637
<b>Scale of the project activity</b>	<input checked="" type="checkbox"/> Large-scale <input type="checkbox"/> Small-scale
<b>Version number of the verification and certification report</b>	· Version 01.2
<b>Completion date of the verification and certification report</b>	· 17/10/2019
<b>Monitoring period number and duration of this monitoring period</b>	· Monitoring period number: 16 <sup>th</sup> · Duration: 27/05/2019 – 18/08/2019
<b>Version number of the monitoring report to which this report applies</b>	· Version 01.1
<b>Crediting period of the project activity corresponding to this monitoring period</b>	· 25/02/2013 ~ 24/02/2023 (Fixed, 10 years)
<b>Project participants</b>	· Hu-Chems Fine Chemical Corp. · Carbon Climate Protection GmbH
<b>Host Party</b>	· Republic of Korea
<b>Applied methodologies and standardized baselines</b>	· Applied methodology: ACM0019 Version 01 (N <sub>2</sub> O abatement from nitric acid production) · No standardized baseline(s) applicable
<b>Mandatory sectoral scopes</b>	· Sectoral scope: 5-Chemical industries
<b>Conditional sectoral scopes, if applicable</b>	No conditional sectoral scope(s) linked to the applied methodology
<b>Estimated amount of GHG emission reductions or GHG removals for this monitoring duration in the registered PDD</b>	· Amount estimated in PDD for 2019: 298,797 tCO <sub>2</sub> e → Corresponding estimated amount for the duration of monitoring period (84 days): 68,764 tCO <sub>2</sub> e
<b>Certified amount of GHG emission reductions or GHG removals for this monitoring period</b>	· 77,092 tCO <sub>2</sub> e
<b>Name and UNFCCC reference number of the DOE</b>	· Name: Korean Foundation for Quality (KFQ) · Ref. No.: E-0025
<b>Name, position and signature of the approver of the verification and certification report</b>	Yu Shim JEONG  Managing Director of Sustainability management institute

## SECTION A. Executive summary

>>

Hu-Chems Fine Chemical Corporation (Hu-Chems) has commissioned Korean Foundation for Quality (KFQ) to carry out the verification and certification of emission reductions reported for the "Reduction of N<sub>2</sub>O emissions from the new nitric acid plant #5 of Hu-Chems Fine Chemical Corp." in the Republic of Korea (the project) in the period 27/05/2019 to 18/08/2019. This report contains the findings from the verification and a certification statement for the certified emission reductions.

### Verification objective

Verification is the periodic, thorough and independent assessment and ex post determination by a Designated Operational Entity (DOE) of the monitored reductions in 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 "Reduction of N<sub>2</sub>O emissions from the new nitric acid plant #5 of Hu-Chems Fine Chemical Corp." for the period 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 or any approved revised 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 Board regarding deviations from the provisions of a registered plan and/or methodology.
- Data is recorded and stored as per the monitoring methodology ACM0019 (version 01) 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 MR received from the PPs. Only verification activities after the publication of the 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 and CLs raised (if any), the final verification report is prepared. The final report then

undergoes a technical review and final approval according to KFQ's internal quality assurance procedures.

The data presented in the MR were assessed by review of the detailed project documentation and production records, as well as by interviews with personnel at Hu-Chems and Carbon Climate Protection GmbH, 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 ACM0019 (version 01) as well as the monitoring plan and the management system were assessed during the site visit.

### Description of the project activity

Project Parties:	Republic of Korea (Host) Austria
Title of project activity:	Reduction of N <sub>2</sub> O emissions from the new nitric acid plant #5 of Hu-Chems Fine Chemical Corp.
UNFCCC Registration Number:	6637
Project Participants:	·Hu-Chems Fine Chemical Corp. (Korea) ·Carbon Climate Protection GmbH (Austria)
Baseline and monitoring methodology:	ACM0019 (Version 01)
Location of the project activity:	Address: Yeosu, 7-6, Wollae-dong, Jeollanam-do, Republic of Korea
	GPS Coordinates: Longitude: 127.74158E / Latitude: 34.84583N
Registered PDD:	Version 1.4 of 22/06/2012
Validation:	Validation report of 03/07/2012 by TÜV SÜD
Registration Date:	17/07/2012
Crediting Period:	25/02/2013 to 24/02/2023 (changed from 01/09/2012 to 31/08/2022)
Period verified in this verification:	27/05/2019 to 18/08/2019

The project has installed tertiary N<sub>2</sub>O reduction technology in the tail gas stream of the #5 nitric acid production plant of Hu-Chems in Yeosu, Korea. Nitrous oxide, formed as a by-product of the nitric acid production, is removed by an EnviNOx® System provided by UHDE GmbH.

The EnviNOx® process used in the #5 nitric acid plant is based on the catalytic decomposition of nitrous oxide (N<sub>2</sub>O) and the catalytic reduction of NO<sub>x</sub> (NO and NO<sub>2</sub>) with ammonia (NH<sub>3</sub>). The reactions take place over two iron zeolite catalyst beds.

The tail gas from the nitric acid facility is fed into EnviNOx® System, and according to the ex-ante emission reductions in the registered PDD, the N<sub>2</sub>O is reduced by approximately 96%. The tail gas volume flow and the N<sub>2</sub>O concentration at the outlet of the EnviNOx® System are monitored and recorded.

## Conclusion

KFQ has performed the verification of the emission reductions reported for the project activity “Reduction of N<sub>2</sub>O emissions from the new nitric acid plant #5 of Hu-Chems Fine Chemical Corp.” in Korea (UNFCCC Registration Ref. No. 6637) for the period 27/05/2019 to 18/08/2019.

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 the EnviNOx® System and records from the production logs of the nitric acid production have been examined and verified for the reporting period.

The verification team has during its preparations identified the key reporting risks and used the assessment to determine to which extent the project operator’s control systems were adequate for mitigation of these key reporting risks. In addition, other areas that can have an impact on 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 and its associated documents.

The implementation of the project resulted in 77,092 tCO<sub>2</sub>e of emission reductions during the period from 27/05/2019 to 18/08/2019 which is within the fixed crediting period from 25/02/2013 to 24/02/2023. In our opinion, the GHG emission reductions reported for the project in the MR (Version 01.1) are fairly stated. The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology ACM0019 (version 01) and the monitoring plan contained in the PDD (version 1.4 dated 22/06/2012).

KFQ is able to certify that the emission reductions from the “Reduction of N<sub>2</sub>O emissions from the new nitric acid plant #5 of Hu-Chems Fine Chemical Corp.” in Korea during the period from 27/05/2019 to 18/08/2019 amount to 77,092 tonnes of CO<sub>2</sub>e.

## SECTION B. Verification team, technical reviewer and approver

### B.1. Verification team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interviews	Verification findings
1	Team Leader(*)	IR	LEE	Mi Jung	KFQ	√	√	√	√
2	Verifier(*)	IR	KANG	Yeong Gyeong	KFQ	√	√	√	√
3	Verifier(*)	IR	PARK	Su Hyun	KFQ	√	√	√	√

(\*) means a personnel with technical expertise in technical area 5.2

**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	CHO	Jin Seok	KFQ
2	Approver	IR	YEOM	Soon Hong	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	Methodology and tool require a rather low number of monitoring parameters	In response of that risk, the KFQ verification team included three verifiers in total and all of them participate in on-site to cover/review all monitoring parameters in a complete and detailed manner.
2	Error rate in Monitoring report	L	Expert organization is involved in compilation of MR as well as calculation	In response of that risk, the KFQ verification team focused on systematic consistency and error checks
3	Familiarity with Monitoring system	L	This is 16 <sup>th</sup> monitoring period. Expert organization is involved in the periodic inspection of monitoring equipment	In response to that risk, the KFQ verification team checked the existence of any and all monitoring instruments as well as their valid calibration, independently from the fact that the PPs would be familiar with the monitoring system.
4	QA/QC	L	Stable QA/QC system has been implemented and integrated into existing QMS	In response to that risk, the KFQ verification team focused on periodic calibration and QA/QC activities performed as per EN 14181 as well as on plausibility check in order to ensure data quality.
5	Data flow	L	Transferred to the spreadsheet automatically	In response to that risk, the KFQ verification team checked the safeguard measures for raw data and crosschecked raw data with the MS Excel spreadsheets on a random sampling basis, in an extent to ensure the functioning of the transferring system.
6	Recalculation	M	Calculation is performed in excel spreadsheet applying formulae. However, recalculation is done manually.	In response to that risk, the KFQ verification team firstly checked on the existence of omissions of events for recalculations and secondly reviewed all recalculations in detail.

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 them. 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" (ver. 02).

## **C.2. Consideration of materiality in conducting the verification**

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There was one finding detected, but it does not impact the amount of emission reductions. As the finding 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 PPs especially the MR, (Version 01.0 dated 02/09/2019, published on 09/09/2019) and the CDM Project spreadsheet. 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 Guidances applicable to the project activity, e.g. Clean Development Mechanism Validation and Verification Standard, Clean Development Mechanism Project Standard, Clean Development Mechanism Project Cycle Procedure, Checklist for requests for post-registration changes to project activities and 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;
- Review the monitoring plan contained in the registered PDD and monitoring methodology. Check the compliance of the MR with respect to the monitoring plan 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 GHG data and ER; and
- 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 Hu-Chems Fine Chemicals Corp. on 02/10/2019. 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 the 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, inventories, purchase records 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 ACM0019 (Version 01);
- 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: 02/10/2019				
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.	Yeosu	02/10/2019	Mi Jung LEE Yeong Gyeong KANG Su Hyun PARK
2	Review of the complete data flow from data generation, aggregation, recording, calculation to reporting of the monitoring parameters.	Yeosu	02/10/2019	Mi Jung LEE Yeong Gyeong KANG Su Hyun PARK
3	Confirmation of the complete & correct implementation of procedures for the operation and data collection.	Yeosu	02/10/2019	Mi Jung LEE Yeong Gyeong KANG Su Hyun PARK
4	Verification of the information provided in the MR and documentation with other sources.	Yeosu	02/10/2019	Mi Jung LEE Yeong Gyeong KANG Su Hyun PARK
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.	Yeosu	02/10/2019	Mi Jung LEE Yeong Gyeong KANG Su Hyun PARK
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.	Yeosu	02/10/2019	Mi Jung LEE Yeong Gyeong KANG Su Hyun PARK

### D.3. Interviews

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

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1	HAN	Du Hee	Hu-Chems Fine Chemicals Corp.	02/10/2019	General support	Mi Jung LEE Yeong Gyeong KANG Su Hyun PARK
2	BAEK	Jongmin	Same as above	02/10/2019	General support, Maintenance	Mi Jung LEE Yeong Gyeong KANG Su Hyun PARK
3	KIM	Jin Sung	Same as above	02/10/2019	Production, Documentation	Mi Jung LEE Yeong Gyeong KANG Su Hyun PARK
4	LEE	Seunghun	Same as above	02/10/2019	General support, Maintenance	Mi Jung LEE Yeong Gyeong KANG Su Hyun PARK

5	Dunkel-Schwarzenberger	Gerald	Carbon Climate Protection GmbH	02/10/2019	QA/QC, Calculation, Reporting	Mi Jung LEE Yeong Gyeong KANG Su Hyun PARK
6	Roshdy	Mahmoud	Carbon Climate Protection GmbH	02/10/2019	General Support	Mi Jung LEE Yeong Gyeong KANG Su Hyun PARK
7	Ashour	Fatehy	Carbon Climate Protection GmbH	02/10/2019	General Support	Mi Jung LEE Yeong Gyeong KANG Su Hyun PARK

#### D.4. Sampling approach

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As per the requirements set out in VVS (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 PPs.

Since automatic transferred system to the spreadsheet is in place, Crosscheck for data in spreadsheet against raw data were done based on random sampling after confirming safeguard measure for raw data in DCS and server and transferring system. Thus, the sampling plan prepared by the verification team for verification needed not to be revised as no omissions in the detection process of events related to emission reductions were found.

Whereas recalculations for all events, the locations, calibrations of all measurement instruments and intervals (Measuring frequency, Reading frequency and 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	0	0
Post-registration changes	0	0	0
Compliance of the registered monitoring plan with the methodologies including applicable tools and standardized baselines	0	0	0
Compliance of monitoring activities with the registered monitoring plan	0	0	0
Compliance with the calibration frequency requirements for measuring instruments	1	0	0
Assessment of data and calculation of emission reductions or net removals	0	0	0
Assessment of reported sustainable development co-benefits	0	0	0
Global stakeholder consultation	0	0	0
Others (please specify)	0	0	0
<b>Total</b>	<b>1</b>	<b>0</b>	<b>0</b>

The objective of this phase of the verification was to resolve any issues which 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 deviations 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:

- Non-conformities with the monitoring plan or methodology are found in monitoring and reporting has not been sufficiently documented by the project participants, or if the evidence provided to prove conformity is insufficient;



- ii. Modifications to the implementation, operation and monitoring of the registered project activity has not been sufficiently documented by the project participants;
- 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 the project participants.

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.

1 CL was raised for this monitoring period, which was closed after the PPs satisfactorily addressed it in the revised MR Version 01.1.

## SECTION E. Verification findings

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

<b>Means of verification</b>	KFQ has checked the MR provided by the PP against the latest monitoring report form in order to determine, whether the MR is in compliance with it.
<b>Findings</b>	The PP submitted the MR to DOE applying the Monitoring Report Form Version 07.0. It was found that there are no deviations between the MR and the latest monitoring report form. It is identified during document review that the MR has no blank section.
<b>Conclusion</b>	The verification team concludes that the MR (Version 01.0 and 01.1) are in compliance with the latest monitoring report form (Version 07.0) and the instructions therein.

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

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There was a forward action request (FAR) raised from validation and no FAR was raised from previous verification. The FAR was sufficiently addressed by the PPs. Please refer to Appendix 4 of this report for more details with regard to the FAR from validation.

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

<b>Means of verification</b>	<p><b>Physical project implementation</b></p> <p>During the on-site visit, the KFQ verification team visually inspected the installations of the EnviNOx® system and all instrumentations necessary for the monitoring of the emission reductions and checked, 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 (Version 1.4 dated 22/06/2012) and the monitoring plan. Also, the KFQ verification team reviewed the documentation in respect of start-up and operation of the EnviNOx® systems, monitoring instrument specifications including containing details such as instrument history and measuring ranges.</p> <p><b>Project operation</b></p> <p>The verification team checked the operational records, catalyst invoices and other relevant information (Appendix 3) and interviewed relevant plant staff on the actual operation and campaigns of the nitric acid plant and the EnviNOx® system. Also daily reports, event log files, service reports, maintenance &amp; calibration reports, DeltaV curves and detecting process of events were checked by the KFQ verification team, especially with regard to times with shutdowns and special events, as indicated in the MR.</p> <p><b>Management system and quality control and quality assurance</b></p>
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	<p>The operation procedures and QA/QC procedures and respective reports have been reviewed and crosschecked by the KFQ verification team. Furthermore, the latest organizational arrangements were checked by means of interviews with relevant staff from Hu-Chems and Carbon Climate Protection GmbH (hereinafter referred to as "CCP").</p> <p><b>Consecutive monitoring period</b></p> <p>The verification team checked monitoring period of previous verifications through interviews with staff from Hu-Chems Fine Chemical Corp. and CCP as well as history of requests for issuance provided by UNFCCC website to confirm consecutive monitoring periods of this project activity.</p>
<b>Findings</b>	<p><b>Physical project implementation</b></p> <p>The project covers a catalytic N<sub>2</sub>O reduction technology in its nitric acid plant Hu-Chems #5. The project was registered on 17/07/2012 and the new nitric acid plant #5 was scheduled to operate in 2012 and the starting period of crediting period was 01/09/2012 as per the registered PDD. However, the project has been in operation since 25/02/2013 and the starting date of crediting period has changed from 01/09/2012 to 25/02/2013. This change to the starting date of the crediting period was already done before this Monitoring Period approved by the UNFCCC Secretariat via E-mail and was published on the relevant project view page.</p> <p>The starting date of operation of the project activity with putting all physical features and data collection system and storage in place was confirmed by KFQ verification team. 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><b>Project operation</b></p> <p>During the monitoring period, in total lasting for 84 days, the nitric acid plant Hu-Chems #5 as well as its EnviNOx® system was in normal operation.</p> <p>The monitoring system &amp; 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 monitoring report are complete, respective re-calculation of N<sub>2</sub>O emissions during times of observations (if applicable) were done correctly &amp; conservatively in the project spreadsheets and in accordance with the registered PDD and the applied methodology. It is identified that instruments have been regularly calibrated.</p> <p>The verification team has checked the MR (Version 01.1) and found that some editorial changes were done in section B.1. b). of MR. It is confirmed that the reasons of the events are accurately described in the MR. When there was a delayed calibration during this monitoring period, recalculation was done correctly &amp; conservatively (in compliance with VVS requirements).</p> <p><b>Management system and Quality assurance</b></p> <p>KFQ found that the project is operated and monitored by Hu-Chems and CCP is responsible for checking and reporting the data of the CDM activity as well as for supervision. The procedures &amp; responsibilities are described in the MR and are considered and applied in full. There are no deviations between the MR and the actual situation.</p> <p>With respect to quality control and quality assurance, the KFQ verification team has found that the EnviNOx system and the monitoring system are designed as an automatic process, so the involvement of the personnel during normal operation is minimised. In case of any deficiency, appropriate procedures are in place. The MR includes a detailed description of the periodical observations of the EnviNOx system and the monitoring instruments, in case of failures responsibilities are defined.</p> <p>It has been found that a service agreement is in place for the analyser system and the DeltaV system between Hu-Chems and Emerson Process Management Korea Ltd. The contract covers regular preventive checks on operational condition of the</p>

	<p>analyser system (on a monthly basis), "On site" DeltaV system health checks (on a monthly basis), 24 hour emergency service, inspections visits (on a quarterly basis) and respective reporting. Service reports of performed maintenance activities, calibrations and checks and other service reports (where applicable) were made available for verification and were found to be complete &amp; suitable. Data handling solutions involve redundancy check, data manipulation protection, integrity check as well as archiving and were also found to be suitable. Safeguarding procedures in accordance to the monitoring plan have been applied in a conservative way.</p> <p>KFQ found that the quality assurance and quality control procedures in terms of equipment operation, maintenance, calibration as well as data reporting are covered by project operator's management system which is certified to comply with ISO 9001:2015 and ISO 14001:2015, certification has found to be valid during the whole monitoring period. Hu-Chems covers all CDM activities in the internal, external audit and management reviews.</p> <p>It was found that local operators and instrumentation engineers of the system have been trained by the equipment suppliers. The related procedures were kept on site and were easily available.</p> <p><b>Consecutive monitoring period</b> This is the 16<sup>th</sup> monitoring period since registration of this project activity. Previous monitoring reports were already 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 confirms monitoring periods of this project have been consecutive.</p>
<b>Conclusion</b>	<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"> <li>• 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</li> <li>• All other relevant information provided in the MR is fully in accordance with respective information stated in the registered PDD; and</li> <li>• The information on project operation, the management system and quality assurance are complete, correct and in accordance with the registered PDD; and</li> <li>• The management system and quality assurance and related procedures have implemented as described in the MR and in accordance with the registered PDD; and</li> <li>• The monitoring periods of this project have been consecutive.</li> </ul>

#### E.4. Post-registration changes

##### E.4.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents<sup>1</sup>

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

##### E.4.2. Corrections

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

<sup>1</sup> Other standards, methodologies, methodological tools and guidelines (to be) applied in accordance with the applied (selected) methodologies are collectively referred to as the other (applied) methodological regulatory documents.

**E.4.3. Changes to the start date of the crediting period**

&gt;&gt;

There were no post registration changes identified by verification team during this verification. Already before this Monitoring Period, the start date of the crediting period was changed from 01/09/2012 (indicated date in the registered PDD) to 25/02/2013 (start of regular operation of the EnviNOx® system). This change to the starting date of the crediting period was approved by the UNFCCC Secretariat via E-mail and was published on the relevant project view page.

**E.4.4. Inclusion of a monitoring plan**

&gt;&gt;

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

**E.4.5. Permanent changes from registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines or other methodological regulatory documents**

&gt;&gt;

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

**E.4.6. Changes to the project design**

&gt;&gt;

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

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

&gt;&gt;

N/A

**E.5. Compliance of the registered monitoring plan with applied methodologies, applied standardized baselines, and other applied methodological regulatory documents**

<b>Means of verification</b>	The KFQ verification team reviewed the monitoring plan contained in the registered PDD, version 1.4 dated 22/06/2012 against the approved methodology applied by the project activity, ACM0019 (version 01) and "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0).
<b>Findings</b>	The KFQ verification team found that there were no incompliances between the monitoring plan contained in the registered PDD, the applied methodology ACM0019 (Version 01) and "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0). Furthermore, it was found that there were no standardized baselines applied in the project activity.
<b>Conclusion</b>	KFQ confirms that the monitoring plan is in accordance with the approved methodology applied by the project activity, ACM0019 (version 01) and "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0). There is also no applicable standardized baseline for the project activity.

**E.6. Compliance of monitoring activities with the registered monitoring plan**General statement on data and parameters monitored

<b>Means of verification</b>	The means of verification in relation to the different parts (Information flow and data collection system, monitoring parameters) are stated in detail in the section & tables further below.
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<b>Findings</b>	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.
<b>Conclusion</b>	<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 has been properly implemented and is followed by the PPs.</p> <p>KFQ confirms that all parameters stated in the monitoring plan and relevant board decisions 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 of this parameter is controlled in accordance with the monitoring plan as well as the applied methodology and as per the relevant guidance provided by the CDM Executive Board.</p> <p>KFQ confirms that the measured values during delayed calibration period is correctly adjusted by applying the maximum permissible error of the instrument as per the requirement of VVS (ver.02.0) (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.</p> <p>KFQ confirms that the MR lists each parameter required by the monitoring plan 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

<b>Means of verification</b>	'Data and parameters fixed ex-ante' listed in the MR have been crosschecked & reviewed against – as applicable – the monitoring plan contained in the registered PDD as well as applied methodology ACM0019 (Version 01), Tool to determine the mass flow of a greenhouse gas in a gaseous stream (Version 03.0) and other relevant CDM related documentation.			
<b>Findings</b>	<i>Data &amp; Parameters fixed ex-ante and generally relevant for the project activity</i>			
	<b>Data/parameter (description, unit)</b>	<b>Source of data</b>	<b>Value(s) applied</b>	<b>KFQ Findings</b>
	<ul style="list-style-type: none"> <li>EF<sub>default,y</sub> Default N<sub>2</sub>O baseline emissions factor in the calendar year y of the monitoring period n (kgN<sub>2</sub>O/tHNO<sub>3</sub>)</li> </ul>	PDD / ACM0019 (ver. 01)	2.70	Crosscheck of the value with the registered PDD & Monitoring plan and the applied methodology showed compliance of parameter.
	<ul style="list-style-type: none"> <li>GWP<sub>N<sub>2</sub>O</sub> Global warming potential of N<sub>2</sub>O (tCO<sub>2</sub>e/tN<sub>2</sub>O)</li> </ul>	Relevant decisions by the CMP (2 <sup>nd</sup> Kyoto protocol commitment period) & according to the registered PDD / ACM0019 (ver. 01)	298	Value is correctly applied & justified and has been determined in accordance with the provisions of the CDM project standard, the PDD and ACM0019 (Version 01).
	<ul style="list-style-type: none"> <li>R<sub>u</sub> Universal ideal gases constant (Pa.m<sup>3</sup>/kmol.K)</li> </ul>	PDD / "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (ver. 03.0)	8,314	Crosscheck of the value with the registered PDD & Monitoring plan and the applied methodology showed compliance of parameter.

	<ul style="list-style-type: none"> <li>MM<sub>i</sub> Molecular mass of greenhouse gas i (kg/kmol)</li> </ul>	PDD / "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (ver. 03.0)	44.02	Crosscheck of the value with the registered PDD & Monitoring plan and the applied methodology showed compliance of parameter.
	A complete set of data covering the monitoring period has been provided to KFQ and been reviewed during verification.			
<b>Conclusion</b>	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 ACM0019 (Version 01), Tool to determine the mass flow of a greenhouse gas in a gaseous steam (Version 03.0) and other CDM related documentation, where applicable.			

## E.6.2. Data and parameters monitored

### Information flow & data collection system

<b>Means of verification</b>	<p>The KFQ verification team assessed the information flow and data collection system and by means of physical inspection of all major components of the information flow &amp; data collection system as well as related documentation. Interviews with relevant staff were held in order to experience the system in action. Furthermore, the verification of the information flow (where applicable) for all monitoring parameters was successfully done by means of following documents and cross checks:</p> <p><i>Data generation and aggregation:</i></p> <ul style="list-style-type: none"> <li>Calibration records and certificates</li> <li>Monthly Health Check reports</li> <li>Quarterly Inspection Check Reports</li> <li>General Maintenance service reports</li> <li>Plausibility of tail gas flow volume flows with ex-ante values in the PDD</li> <li>Monthly Emerson Service Reports, confirming the functionality of the data transmission system for all instruments</li> <li>Certificate of analysis of the standard test gas for analyser calibration</li> <li>Intervals (measuring frequency, reading frequency, recording frequency) of instruments for each instrument are also verified through display panel on-site and DCS generated</li> </ul> <p><i>Aggregation to recording:</i></p> <ul style="list-style-type: none"> <li>Monthly Emerson Service Reports, confirming the functionality of the data storage system for all instruments</li> <li>Data cross check between values from analysers/transmitters and values in control room</li> <li>Data cross check between DeltaV Trend curves (directly generated from raw data) and DeltaV Reports</li> </ul> <p><i>Calculation and reporting:</i></p> <ul style="list-style-type: none"> <li>Crosscheck of implemented calculations in Excel sheets against the PDD formulae</li> <li>Data cross check between DeltaV Report, production reports, and Excel Sheets</li> </ul>
<b>Findings</b>	<p>As stated in the MR and verified by the KFQ verification team, common data flow systems are used in the project activity for the following parameters:</p> <ul style="list-style-type: none"> <li>Nitric acid production (<math>P_{NA,n}</math>)</li> <li>Operating parameter of the nitric acid plant (<math>NH_3</math> flow to AOR for determining <math>h_n</math>)</li> <li>Volumetric flow, temperature and pressure of the tail gas stream (<math>V_{t,db}</math>, <math>T_t</math>, <math>P_t</math>)</li> <li>Volumetric fraction of <math>N_2O</math> in the tail gas stream (<math>v_{i,t,db}</math>)</li> </ul>

	<p>KFQ also verified that the instrument transmitters continuously provide an analogue signal to I/O cards and the signals are collected by a DCS Processor (DeltaV, respectively). Thus, collected and processed data, i.e. calculation, raw data, calculated values, are stored in the server continuously and available in the network system as digital values. DCS System (DeltaV, respectively) also generates aggregated daily reports based on the raw data stored at the delegated server. Data are digitally transferred to the Excel sheets, where calculations of emission reductions are performed.</p> <p>It was found by the KFQ verification team, that the information flow &amp; data collection system are 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>
<b>Conclusion</b>	<p>The KFQ verification team confirms that the information flow &amp; data collection system meets the requirements of the registered PDD and its monitoring plan as per the applied and approved methodology, ACM0019 (Version 01) as well as the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 03.0). Intervals (measuring frequency, reading frequency and recording frequency) are applied in accordance with the applied methodology, the above mentioned tools and the monitoring plan.</p>

#### Assessment on data/ parameters

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).

<b>Data/Parameter</b>	<b>P<sub>NA,n</sub></b>
<b>Data Unit</b>	tHNO <sub>3</sub>
<b>Description</b>	Nitric acid produced in the monitoring period n
<b>Source of data used</b>	Production reports (based on measurements from project participants)
<b>Value(s)</b>	100,656 tHNO <sub>3</sub> (total value in the monitoring period)
<b>Means of verification</b>	<p>The KFQ verification team checked, whether the monitoring activities in relation to this parameter comply with the monitoring plan by physically inspecting the applied measuring device &amp; related equipment for generation, aggregation, recording and reporting. The verification team checked the DCS daily reports and compared the values reported in the excel spreadsheets. All results have been verified against the requirements out of the monitoring plan and the applied methodology.</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 and the applied methodology.</p>
<b>Findings</b>	<p>Locations of instruments have been verified by physical inspection and are in accordance with the description in the MR. All specifications in relation of this parameter are fulfilled and suitable instruments and ranges are used. Monitoring results are fully available at the required intervals for the whole monitoring period.</p> <p>The nitric acid flow and density are measured with a mass flow meter, temperature with a temperature measurement and concentration is automatically determined based on measured parameters. Values are sent to the DCS (control room), and the nitric acid production (as 100% HNO<sub>3</sub>) is calculated based on mass flow and HNO<sub>3</sub> concentration. Final production values are exported in production reports through the DeltaV System. Data from the DeltaV daily reports are digitally transferred to spreadsheets where emission reduction calculations are performed. There were no errors found in the digital transfer of data from the DeltaV daily reports to the spreadsheets.</p> <p>The calibration and maintenance routines for the parameter are the responsibility of Hu-Chems. The QA/QC and related procedures are covered by the ISO 9001 / ISO 14001 Quality Management Procedures of the nitric acid plant and considered appropriate by the verification team. Valid calibration certificates</p>

	covering the whole monitoring period are available for the used equipment. It was found that the calibrations were carried out for a measuring range comparable with the actual measuring range and that the calibrations confirmed proper functioning of the monitoring equipment.
<b>Conclusion</b>	<p>KFQ confirms that the monitoring of this parameter has been carried out in accordance with the monitoring plan and any monitoring activities comply with it. KFQ confirms that monitoring results of this parameter are consistently recorded as per the approved frequency.</p> <p>KFQ confirms that the equipment used for monitoring of this parameter is calibrated in accordance with the monitoring plan, the applied methodology as well as methodological tools and the relevant guidance provided by the CDM Executive Board. Details on calibration are given in section E.7 below.</p> <p>KFQ confirms that QA/QC procedures are suitable and have been applied in accordance with the monitoring plan.</p>

<b>Data/Parameter</b>	$h_n$
<b>Data Unit</b>	-
<b>Description</b>	Number of hours of operation in a monitoring period n
<b>Source of data used</b>	Measuring device
<b>Value(s)</b>	2,016 (total value in the monitoring period)
<b>Means of verification</b>	<p>As per the PDD, the flow of <math>NH_3</math> to the ammonia oxidation reactor indicates the operational status. In case, the volume flow of <math>NH_3</math> to the ammonia oxidation reactor lies above the threshold of 500 <math>Nm^3/h</math> during an hour, the reactor is considered in normal operation. KFQ has checked, whether this has been correctly determined in the MS Excel sheets based on measured data, in accordance with the PDD and the respective monitoring plan.</p> <p>The KFQ verification team also checked, whether the monitoring activities in relation to the volume flow to the AOR comply with the monitoring plan by physically inspecting the applied measuring device &amp; related equipment for generation, aggregation, recording and reporting. The verification team checked the DCS daily reports and compared the values reported in the excel spreadsheets. All results have been verified against the requirements out of the monitoring plan and the applied methodology.</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 and the applied methodology.</p>
<b>Findings</b>	<p>Location of instrument for measuring the <math>NH_3</math> flow to the AOR has been verified by physical inspection and is in accordance with the description in the MR. All specifications in relation of this parameter are fulfilled and suitable instrument and ranges are used. Monitoring results are fully available at the required intervals for the whole monitoring period.</p> <p>The flow of <math>NH_3</math> to the ammonia oxidation reactor indicates the operational status. In case, the volume flow of <math>NH_3</math> to the ammonia oxidation reactor lies above the threshold of 500 <math>Nm^3/h</math> during an hour, the reactor is considered in normal operation. This has been confirmed by the plant designer UHDE, as stated in the registered PDD.</p> <p>The instrument continuously provides an analogue signal to an I/O card. Data are made available in the network system as digital values and are stored by a server. DCS System generates aggregated daily reports based on stored raw data. Data from daily reports are digitally transferred to spreadsheets, where emission reduction calculations are performed. There were no errors in the digital transfer of data from the DCS daily reports to the spreadsheets. It was found that the determination of the parameter based on measured values has been implemented correctly in the spreadsheets and is traceable and transparent. Values over the monitoring period are correct.</p>
<b>Conclusion</b>	<p>KFQ confirms that the monitoring of this parameter has been carried out in accordance with the monitoring plan and any monitoring activities comply with it. KFQ confirms as well that</p>



	<ul style="list-style-type: none"> <li>• The monitoring of the volume flow to the AOR has been carried out in accordance with the monitoring plan and any monitoring activities comply with it ; and</li> <li>• The monitoring results of the volume flow to the AOR are consistently recorded as per the approved frequency ; and</li> <li>• The equipment used for monitoring of this parameter is calibrated in accordance with the monitoring plan, the applied methodology as well as methodological tools and the relevant guidance provided by the CDM Executive Board. Details on calibration are given in section E.7 below ; and</li> <li>• The QA/QC procedures are suitable and have been applied in accordance with the monitoring plan.</li> </ul>
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<b>Data/Parameter</b>	<b>V<sub>t,db</sub></b>
<b>Data Unit</b>	m <sup>3</sup> dry gas/h
<b>Description</b>	Volumetric flow of the gaseous stream in time interval t on a dry basis
<b>Source of data used</b>	Measuring device
<b>Value(s)</b>	256,751 m <sup>3</sup> dry gas/h (average value in the monitoring period)
<b>Means of verification</b>	<p>The KFQ verification team checked, whether the monitoring activities in relation to this parameter comply with the monitoring plan by physically inspecting the applied measuring device &amp; related equipment for generation, aggregation, recording and reporting. Furthermore, the KFQ verification team performed data checks between trend curves (generated from raw data) and DCS daily reports. Furthermore, the verification team checked the DCS daily reports and the values reported in the excel spreadsheets. All results have been verified against the requirements out of the monitoring plan, the applied methodology and the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 03.0).</p> <p>Furthermore, procedures and records on calibration, maintenance as well as QA/QC and EN 14181 related activities have been reviewed, discussed in interviews and checked against the requirements out of the monitoring plan and the applied methodology.</p>
<b>Findings</b>	<p>Location of instrument has been verified by physical inspection and is in accordance with the description in the MR. All specifications in relation of this parameter are fulfilled and suitable instrument and range are used. Monitoring results are fully available at the required intervals for the whole monitoring period.</p> <p>The instrument continuously provides an analogue signal to an I/O card. Data are made available in the network system as digital values and are stored by a server. DCS System generates aggregated daily reports based on stored raw data. Data from daily reports are digitally transferred to spreadsheets, where emission reduction calculations are performed. There were no errors in the digital transfer of data from the DCS daily reports to the spreadsheets.</p> <p>The calibration and maintenance routines for the parameter are the responsibility of Hu-Chems. The QA/QC and related procedures are covered by the ISO 9001 / ISO 14001 Quality Management Procedures of the nitric acid plant. In addition, QA is covered by EN 14181, especially QAL 2 reference measurements (calibration). Valid calibration covering the whole monitoring period is available for the used equipment. The correction factor out of the calibration curve determined during the QAL 2 reference measurement (calibration) has been correctly applied on an hourly basis in the emission reduction spreadsheet. It was found that the calibrations were carried out for a measuring range comparable with the actual measuring range and that the calibrations confirmed proper functioning of the monitoring equipment.</p>
<b>Conclusion</b>	<p>KFQ confirms that the monitoring of this parameter has been carried out in accordance with the monitoring plan and any monitoring activities comply with it.</p> <p>KFQ confirms that monitoring results of this parameter are consistently recorded as per the approved frequency.</p> <p>KFQ confirms that the equipment used for monitoring of this parameter is calibrated in accordance with the monitoring plan, the applied methodology as well as methodological tools and the relevant guidance provided by the CDM Executive Board. Details on calibration are given in section E.7 below.</p>

	KFQ confirms that QA/QC procedures are suitable and have been applied in accordance with the monitoring plan.
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<b>Data/Parameter</b>	$V_{i,t,db}$
<b>Data Unit</b>	m <sup>3</sup> gas i/m <sup>3</sup> dry gas
<b>Description</b>	Volumetric fraction of greenhouse gas i in a time interval t on a dry basis
<b>Source of data used</b>	Measuring device
<b>Value(s)</b>	$1.93 \times 10^{-5}$ m <sup>3</sup> N <sub>2</sub> O / m <sup>3</sup> dry gas (average value in the monitoring period)
<b>Means of verification</b>	<p>The KFQ verification team checked, whether the monitoring activities in relation to this parameter comply with the monitoring plan by physically inspecting the applied measuring device &amp; related equipment for generation, aggregation, recording and reporting. Furthermore, the KFQ verification team performed data checks between trend curves (generated from raw data) and DCS daily reports. Furthermore, the verification team checked the DCS daily reports, QAL2 &amp; 3 results and the values reported in the excel spreadsheets. All results have been verified against the requirements out of the monitoring plan and the applied methodology.</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 and the applied methodology.</p>
<b>Findings</b>	<p>Location of instrument has been verified by physical inspection and is in accordance with the description in the MR. All specifications in relation of this parameter are fulfilled and suitable instrument and range are used. Monitoring results are fully available at the required intervals for the whole monitoring period.</p> <p>The instrument continuously provides an analogue signal to an I/O card. Data are made available in the network system as digital values and are stored by a server. The N<sub>2</sub>O concentration is measured in ppmv and automatically converted to 'm<sup>3</sup> N<sub>2</sub>O/Nm<sup>3</sup> dry gas' according to the applied methodology and tool.</p> <p>The calibration and maintenance routines for the parameter are the responsibility of Hu-Chems. The QA/QC and related procedures are covered by the ISO 9001 / ISO 14001 Quality Management Procedures of the nitric acid plant. In addition, QA is covered by EN 14181, especially QAL 2 reference measurements (calibration). Valid calibration covering the whole monitoring period is available for the used equipment. The correction factor out of the calibration curve determined during the QAL 2 reference measurement (calibration) as well as results from QAL3 (if applicable) has been correctly applied on an hourly basis in the emission reduction spreadsheet. It was found that the calibrations were carried out for a measuring range comparable with the actual measuring range and that the calibrations confirmed proper functioning of the monitoring equipment.</p>
<b>Conclusion</b>	<p>KFQ confirms that the monitoring of this parameter has been carried out in accordance with the monitoring plan and any monitoring activities comply with it. KFQ confirms that monitoring results of this parameter are consistently recorded as per the approved frequency.</p> <p>KFQ confirms that the equipment used for monitoring of this parameter is calibrated in accordance with the monitoring plan, the applied methodology as well as methodological tools and the relevant guidance provided by the CDM Executive Board. Details on calibration are given in section E.7 below.</p> <p>KFQ confirms that QA/QC procedures are suitable and have been applied in accordance with the monitoring plan.</p>

<b>Data/Parameter</b>	$T_t$
<b>Data Unit</b>	K
<b>Description</b>	Temperature of the gaseous stream in time interval t
<b>Source of data used</b>	Measuring device
<b>Value(s)</b>	409.24 K (average value in the monitoring period)
<b>Means of verification</b>	The KFQ verification team checked, whether the monitoring activities in relation to this parameter comply with the monitoring plan by physically inspecting the applied measuring device & related equipment for generation, aggregation,

	<p>recording and reporting. The verification team checked the DCS daily reports and compared the values reported in the excel spreadsheets. All results have been verified against the requirements out of the monitoring plan and the applied methodology.</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 and the applied methodology.</p>
<b>Findings</b>	<p>Location of instrument has been verified by physical inspection and is in accordance with the description in the MR. All specifications in relation of this parameter are fulfilled and suitable instrument and range are used. Monitoring results are fully available at the required intervals for the whole monitoring period.</p> <p>The instrument continuously provides an analogue signal to an I/O card. Data are made available in the network system as digital values and are stored by a server. DCS System generates aggregated daily reports based on stored raw data. Data from daily reports are digitally transferred to spreadsheets, where emission reduction calculations are performed. There were no errors in the digital transfer of data from the DCS daily reports to the spreadsheets.</p> <p>The calibration and maintenance routines for the parameter are the responsibility of Hu-Chems. The QA/QC and related procedures are covered by the ISO 9001 / ISO 14001 Quality Management Procedures of the nitric acid plant and considered appropriate by the verification team. Valid calibration certificates covering the whole monitoring period are available for the used equipment.</p>
<b>Conclusion</b>	<p>KFQ confirms that the monitoring of this parameter has been carried out in accordance with the monitoring plan and any monitoring activities comply with it. KFQ confirms that monitoring results of this parameter are consistently recorded as per the approved frequency.</p> <p>KFQ confirms that the equipment used for monitoring of this parameter is controlled and calibrated in accordance with the monitoring plan as well as the applied methodology and as per the relevant guidance provided by the CDM Executive Board. Details on calibration are given in section E.7 below.</p> <p>KFQ confirms that QA/QC procedures are suitable and have been applied in accordance with the monitoring plan and the applied methodology.</p>

<b>Data/Parameter</b>	<b>P<sub>t</sub></b>
<b>Data Unit</b>	Pa
<b>Description</b>	Pressure of the gaseous stream in time interval t
<b>Source of data used</b>	Measuring device
<b>Value(s)</b>	99,946 Pa (average value in the monitoring period)
<b>Means of verification</b>	<p>The KFQ verification team checked, whether the monitoring activities in relation to this parameter comply with the monitoring plan by physically inspecting the applied measuring device &amp; related equipment for generation, aggregation, recording and reporting. The verification team checked the DCS daily reports and compared the values reported in the excel spreadsheets. All results have been verified against the requirements out of the monitoring plan and the applied methodology.</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 and the applied methodology.</p>
<b>Findings</b>	<p>Location of instrument has been verified by physical inspection and is in accordance with the description in the MR. All specifications in relation of this parameter are fulfilled and suitable instrument and range are used. Monitoring results are fully available at the required intervals for the whole monitoring period.</p> <p>The instrument continuously provides an analogue signal to an I/O card. Data are made available in the network system as digital values and are stored by a server. DCS System generates aggregated daily reports based on stored raw data. Data from daily reports are digitally transferred to spreadsheets, where emission reduction calculations are performed. There were no errors in the digital transfer</p>

	<p>of data from the DCS daily reports to the spreadsheets.</p> <p>The calibration and maintenance routines for the parameter are the responsibility of Hu-Chems. The QA/QC and related procedures are covered by the ISO 9001 / ISO 14001 Quality Management Procedures of the nitric acid plant and considered appropriate by the verification team. Valid calibration certificates covering the whole monitoring period are available for the used equipment. The instrument has been regularly calibrated, however, there was delayed calibration during this monitoring period. The adjustment of measured data due to delayed calibration was done correctly &amp; conservatively in accordance with VVS (version 02.0).</p>
<b>Conclusion</b>	<p>KFQ confirms that the monitoring of this parameter has been carried out in accordance with the monitoring plan and any monitoring activities comply with it. KFQ confirms that monitoring results of this parameter are consistently recorded as per the approved frequency.</p> <p>KFQ confirms that the equipment used for monitoring of this parameter is controlled in accordance with the monitoring plan as well as the applied methodology and as per the relevant guidance provided by the CDM Executive Board.</p> <p>KFQ confirms that the measured values during delayed calibration period is correctly adjusted by applying conservatively the maximum permissible error of the instrument as per the requirement of VVS (ver.02.0) (Details on calibration are given in section E.7 below.)</p> <p>KFQ confirms that QA/QC procedures are suitable and have been applied in accordance with the monitoring plan and the applied methodology.</p>

<b>Data/Parameter</b>	<b>C<sub>H2O,t,db,n</sub></b>
<b>Data Unit</b>	mg H <sub>2</sub> O/m <sup>3</sup> dry gas
<b>Description</b>	Moisture content of the gaseous stream at normal conditions, in time interval t
<b>Source of data used</b>	Measurements according to the USEPA CF42 method 4 – Gravimetric determination of water content (Measurement Report)
<b>Value(s)</b>	7,000 mg H <sub>2</sub> O/m <sup>3</sup> dry gas (equivalent to 0.007 kgH <sub>2</sub> O/m <sup>3</sup> dry gas)
<b>Means of verification</b>	The KFQ verification team checked, whether the monitoring activities in relation to this parameter comply with the monitoring plan by document review of AST/QAL2 reports issued by the qualified, external entity AIRTEC.
<b>Findings</b>	<p>As per the PDD, the measurements of moisture content were conducted when the calibrations of the flow meter for the gaseous stream (QAL2/AST) were carried out. Repeated measurements were performed by AIRTEC coinciding with QAL2/AST reference measurements (QAL2 during 27/02/2016 to 29/02/2016 and AST during 27/08/2018 to 29/08/2018). The repeated measurements were conducted in accordance with USEPA CF42 method 4.</p> <p>It was found that, according to the report, the moisture content of the gaseous stream is below the maximum threshold value of 0.05 kg H<sub>2</sub>O/m<sup>3</sup> dry gas. Therefore, as stated by the PPs in the MR and according to the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)”, the gaseous stream is to be considered dry.</p>
<b>Conclusion</b>	<p>KFQ confirms that the monitoring of this parameter has been carried out in accordance with the monitoring plan and any monitoring activities comply with it. KFQ confirms that monitoring results of this parameter are consistently recorded as per the approved frequency.</p> <p>KFQ confirms that QA/QC procedures are suitable and have been applied in accordance with the monitoring plan &amp; relevant tool by the performing institute (AIRTEC).</p>

### E.6.3. Implementation of sampling plan

<b>Means of verification</b>	N/A
<b>Findings</b>	N/A
<b>Conclusion</b>	N/A

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

General statement

<b>Means of verification</b>	The means of verification in relation to the specific instruments are stated in detail in the tables further below.
<b>Findings</b>	The findings in relation to the specific instruments are stated in detail in the tables further below.
<b>Conclusion</b>	KFQ confirms that the calibration of the measuring equipment has been conducted as per manufacturer's specifications, applied methodology and the monitoring plan. KFQ confirms, if applicable, that the measured values during the delayed calibration period is correctly adjusted by applying the maximum permissible error of the instrument as per the requirement of VVS (ver.02.0).

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, TAG / 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.

<b>Data/Parameter</b>	<b>P<sub>NA,n</sub></b>
<b>Data Unit</b>	tHNO <sub>3</sub>
<b>Description</b>	Nitric acid produced in the monitoring period n
<b>TAG Number / Serial Number</b>	TAG Number: 325-FT-5-609 Serial number: 14739187
<b>Type</b>	Coriolis flow meter
<b>Accuracy level</b>	± 0.10% of rate
<b>Calibration entity</b>	Woojin Inc. (as per KOLAS)
<b>Calibration frequency</b>	60 Months
<b>Previous calibration (if applicable)</b>	N/A (latest calibration is valid for whole monitoring period)
<b>Latest calibration</b>	09/05/2019 (Validity: 08/05/2024)
<b>Applied period of max. permissible error (when applicable)</b>	N/A (no calibration delay)
<b>Means of verification</b>	The KFQ verification team has visually checked the physical existence of the instrument. The KFQ verification team has checked the calibration records & instrument history against the calibration requirements as per the applied methodology, the monitoring plan as well as the available instrument specifications including manufacturer recommended frequencies.
<b>Findings</b>	It was found that the instrument, as stated in the MR, physically exists and could be identified by the TAG Number and the 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 and was working within the specified error ranges as per available, suitable certificates.
<b>Conclusion</b>	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.
<b>TAG Number / Serial Number</b>	TAG Number: 325-TT-5-237/ Serial number: C2M408098
<b>Type</b>	Temperature transmitter
<b>Accuracy level</b>	±0.14 °C + (±0.02% of span)
<b>Calibration entity</b>	Yokogawa Electric Korea
<b>Calibration frequency</b>	24 Months

<b>Previous calibration (if applicable)</b>	N/A (latest calibration is valid for whole monitoring period)
<b>Latest calibration</b>	09/05/2019 (Validity: 08/05/2021)
<b>Applied period of max. permissible error (when applicable)</b>	N/A (no calibration delay)
<b>Means of verification</b>	The KFQ verification team has visually checked the physical existence of the instrument. The KFQ verification team has checked the calibration records & instrument history against the calibration requirements as per the applied methodology, the monitoring plan as well as the available instrument specifications including manufacturer recommended frequencies.
<b>Findings</b>	It was found that the instrument, as stated in the MR, physically exists and could be identified by the TAG Number and the 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 and was working within the specified error ranges as per available, suitable certificates. The verification team found that date of last calibration of temperature transmitter for measuring nitric acid produced ( $P_{NA,n}$ ) is 09/05/2019 and calibration frequency of it is 24 months. However, validity of last calibration is indicated as 08/05/2024 in MR (version 01.0) which is not 24 months frequency from last calibration. <b><u>(Refer to Appendix 4/Table2/CL ID 01).</u></b> Regarding to CL ID 01, PP corrected the duration of valid calibration frequency and provided the revised MR (version 01.1). The verification team has checked the revised MR (version 01.1) and confirmed that information of monitoring equipment including validity of last calibration is properly stated in the MR.
<b>Conclusion</b>	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.  The raised CL (ID 01) has been completely resolved.

<b>Data/Parameter</b>	$h_n$
<b>Data Unit</b>	-
<b>Description</b>	Number of hours of operation in a monitoring period n
<b>TAG Number / Serial Number</b>	TAG Number: 325-FT-5-520/ Serial number: 14288859
<b>Type</b>	Coriolis flow meter
<b>Accuracy level</b>	$\pm 0.35\%$
<b>Calibration entity</b>	Woojin Inc. (as per KOLAS)
<b>Calibration frequency</b>	60 Months
<b>Previous calibration (if applicable)</b>	N/A (latest calibration is valid for whole monitoring period)
<b>Latest calibration</b>	09/05/2019 (Validity 08/05/2024)
<b>Applied period of max. permissible error (when applicable)</b>	N/A (no calibration delay)
<b>Means of verification</b>	The KFQ verification team has visually checked the physical existence of the instrument. The KFQ verification team has checked the calibration records & instrument history against the calibration requirements as per the applied methodology, the monitoring plan as well as the available instrument specifications including manufacturer recommended frequencies.
<b>Findings</b>	It was found that the instrument, as stated in the MR, physically exists and could be identified by the TAG Number and the 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 and was working within the

	specified error ranges as per available, suitable certificates.
<b>Conclusion</b>	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.

<b>Data/Parameter</b>	$V_{t,db}$
<b>Data Unit</b>	m <sup>3</sup> dry gas/h
<b>Description</b>	Volumetric flow of the gaseous stream in time interval t on a dry basis
<b>TAG Number / Serial Number</b>	TAG Number: 325-FT-5-522/ Serial number: 1230726
<b>Type</b>	Differential pressure transmitter
<b>Accuracy level</b>	< 2.0 % of measuring range
<b>Calibration entity</b>	AIRTEC
<b>Calibration frequency</b>	60 months (EN 14181/QAL2)
<b>Previous calibration (if applicable)</b>	N/A (latest calibration is valid for whole monitoring period)
<b>Latest calibration</b>	QAL2: 27/02/2016 to 29/02/2016 (Validity: 26/02/2021) AST: 27/08/2018 to 29/08/2018
<b>Applied period of max. permissible error (when applicable)</b>	N/A (no calibration delay)
<b>Means of verification</b>	The KFQ verification team has visually checked the physical existence of the instrument. The KFQ verification team has checked the calibration records & instrument history against the calibration requirements as per the applied methodology and the monitoring plan as well as instrument specifications including EN 14181 required frequencies.
<b>Findings</b>	<p>It was found that the instrument, as stated in the monitoring report, physically exists and could be identified by the TAG Number and the 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 and was working within the specified error ranges as per available, suitable certificates.</p> <p>In accordance with EN 14181, QAL2 reference measurement and AST were performed by AIRTEC during 27/02/2016 to 29/02/2016 and during 27/08/2018 to 29/08/2018 respectively. The technical features of instrument in terms of the CDM Project / Monitoring were exactly the same since the start of the monitoring period. Through the interview with PPs and reviewing QAL2 report, the verification team can confirm that the measurement done in February 2016 is representative for the whole monitoring period due to same reliability of instrument. Valid QAL1 certification was found to be in place and available.</p>
<b>Conclusion</b>	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.

<b>Data/Parameter</b>	$V_{i,t,db}$
<b>Data Unit</b>	m <sup>3</sup> gas i/m <sup>3</sup> dry gas
<b>Description</b>	Volumetric fraction of greenhouse gas i in a time interval t on a dry basis
<b>TAG Number / Serial Number</b>	TAG Number: 325-AT-5-018/ Serial number: 393709203380368
<b>Type</b>	NDIR Analyzer
<b>Accuracy level</b>	± 1% (zero/span)
<b>Calibration entity</b>	AIRTEC
<b>Calibration frequency</b>	60 months (EN 14181/QAL2)

<b>Previous calibration (if applicable)</b>	N/A (latest calibration is valid for whole monitoring period)
<b>Latest calibration</b>	QAL2: 27/02/2016 to 29/02/2016 (Validity: 26/02/2021) AST: 27/08/2018 to 29/08/2018
<b>Applied period of max. permissible error (when applicable)</b>	N/A (no calibration delay)
<b>Means of verification</b>	The KFQ verification team has visually checked the physical existence of the instrument. The KFQ verification team has checked the calibration records & instrument history against the calibration requirements as per the applied methodology and the monitoring plan as well as instrument specifications including EN 14181 required frequencies.
<b>Findings</b>	<p>It was found that the instrument, as stated in the MR, physically exists and could be identified by the TAG Number and the serial number. It was found that the instrument has been calibrated regularly and as per the defined requirements.</p> <p>In accordance with EN 14181, QAL2 reference measurement was performed by AIRTEC during 27/02/2016 to 29/02/2016 and AST was performed during 27/08/2018 to 29/08/2018 respectively. The technical features of instrument in terms of the CDM Project / Monitoring were exactly the same since the start of the monitoring period. Through the interview with PPs and reviewing QAL2 report, KFQ can confirm that the measurement done in February 2016 is representative for the whole monitoring period due to same reliability of instrument. Valid QAL1 certification was found to be in place and available.</p> <p>Furthermore, the analyser is self-calibrated (zero, span) using a set of certified calibration gases as QAL3 in accordance with EN 14181.</p> <p>Verification team checked its approach and concluded that PP's approach is appropriate and reasonable. Recalculation is also correctly done and used in ER calculation. The calibration gases applied were marked to be stable in the verifying period and cover the range of measurement. Detailed supplier certificates including information on concentration, accuracy and stability are available.</p> <p>Control check for zero/span test result was conducted as shown in the SHEWHART CONTROL CHART.</p>
<b>Conclusion</b>	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.

<b>Data/Parameter</b>	$T_t$
<b>Data Unit</b>	K
<b>Description</b>	Temperature of the gaseous stream in time interval t
<b>TAG Number / Serial Number</b>	TAG Number: 325-TT-5-161/ Serial number: 1230727
<b>Type</b>	Temperature transmitter
<b>Accuracy level</b>	$\pm(0.30 + 0.0050 t )$
<b>Calibration entity</b>	MSC (as per KOLAS)
<b>Calibration frequency</b>	24 months
<b>Previous calibration (if applicable)</b>	N/A (latest calibration is valid for whole monitoring period)
<b>Latest calibration</b>	09/05/2019 (Validity: 08/05/2021)
<b>Applied period of max. permissible error (when applicable)</b>	N/A (no calibration delay)
<b>Means of verification</b>	The KFQ verification team has visually checked the physical existence of the instrument. The KFQ verification team has checked the calibration records &



	instrument history against the calibration requirements as per the applied methodology, the monitoring plan as well as the available instrument specifications including manufacturer recommended frequencies.
<b>Findings</b>	It was found that the instrument, as stated in the MR, physically exists and could be identified by the TAG Number and the 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 and was working within the specified error ranges as per available, suitable certificates.
<b>Conclusion</b>	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.

<b>Data/Parameter</b>	<b>P<sub>t</sub></b>
<b>Data Unit</b>	Pa
<b>Description</b>	Pressure of the gaseous stream in time interval t
<b>TAG Number / Serial Number</b>	TAG Number: 325-PT-5-362/ Serial number: 1230980
<b>Type</b>	Pressure transmitter
<b>Accuracy level</b>	< 2.0 % of measuring range
<b>Calibration entity</b>	HU-CHEMS Fine Chemical Corp.
<b>Calibration frequency</b>	Monthly
<b>Previous calibration (if applicable)</b>	Calibrated from 17/05/2019 to 12/08/2019 on a monthly basis
<b>Latest calibration</b>	Calibrated from 17/05/2019 to 12/08/2019 on a monthly basis
<b>Applied period of max. permissible error (when applicable)</b>	From 11/08/2019 to 12/08/2019 (Start / End time of calibration delay is in accordance with calibration time)
<b>Means of verification</b>	The KFQ verification team has visually checked the physical existence of the instrument. The KFQ verification team has checked the calibration records & instrument history against the calibration requirements as per the applied methodology, the monitoring plan as well as the available instrument specifications including manufacturer recommended frequencies.
<b>Findings</b>	It was found that the instrument, as stated in the MR, physically exists and could be identified by the TAG Number and the serial number. It was found that the instrument has been calibrated regularly, however, there was delayed calibration from 11/08/2019 to 12/08/2019 during this monitoring period. The result of the delayed calibration is smaller than the maximum permissible error of the instrument during the delayed calibration period. The verification team confirms that the measured values of 'P <sub>t</sub> ' during the delayed calibration period are correctly recalculated by applying the maximum permissible error of the instrument as per the requirement of VVS (ver.02.0). During all other hours it was found that the instrument had a valid calibration and was working within the specified error ranges as per available, suitable certificates.
<b>Conclusion</b>	KFQ confirms that the calibration has been regularly conducted and the equipment used for monitoring is controlled in accordance with the monitoring plan and the applied methodology. The measured values during the delayed calibration period is correctly adjusted by applying the maximum permissible error of the instrument as per the requirement of VVS (ver.02.0)

## 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

<b>Means of verification</b>	KFQ has reviewed all data, parameters and calculations with respect to calculation of the baseline GHG emissions and checked them against the
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	<p>requirements out of the applied methodology ACM0019 (Version 01) and the PDD (Version 1.4, dated on 22/06/2012) 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 PPs 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 production log sheets, meters available in the operators control room or on-site, etc.</p>
<b>Findings</b>	<p>The baseline GHG emissions have been found to be 80,987 tCO<sub>2</sub>e for the verification period. It was found that a complete set of data covering the monitoring period has been provided by the PPs. Activity levels and non-activity parameters have been monitored in accordance with the monitoring plan, 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 ACM0019 (version 01) and the PDD (Version 1.4, dated on 22/06/2012).</p> <p>It was found that all emission factors, GWPs 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 all parameters are automatically collected by the DeltaV DCS provided by Emerson. It was found that there is no uncertainty related to manual transfer of data used in the calculation of emission reduction since the monitored parameters are automatically collected by the DeltaV DCS. All actions performed at the computer station are logged and the log file is available for KFQ. There were no errors in the digital transfer of data from DeltaV DCS files to the excel spreadsheets for the calculation of emissions reductions.</p> <p>It was found that the spreadsheets, including corresponding re-calculations of data during events as described in the MR, were made available completely by the PP and that all formulae have been correctly implemented and are accessible and traceable. Any recalculations are in line with the procedure in the registered PDD and have been checked and found to be correct and conservative. 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 calibrated equipment, and key data could be cross-checked via other sources (if applicable), such as raw data generated in the DCS, production log sheets and meters available in the operators control room or on-site. 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>
<b>Conclusion</b>	<p>KFQ confirms that all required data for calculation of the baseline GHG emissions were available for the whole verification period and no data were missing due to 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 PPs have followed appropriate methods and formulae for calculating baseline GHG emissions 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 baseline GHG emissions for the covered monitoring period is fully complete and based on suitable and verifiable evidence.</p>

### E.8.2. Calculation of project GHG emissions or actual net anthropogenic GHG removals by sinks

<b>Means of verification</b>	<p>KFQ has reviewed all data, parameters and calculations with respect to calculation of the project GHG emissions and checked them against the requirements out of the applied methodology ACM0019 (Version 01) and the PDD (Version 1.4, dated on 22/06/2012) 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 PPs 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 production log sheets, meters available in the operators control room or on-site, etc.</p>
<b>Findings</b>	<p>The project GHG emissions have been found to be 3,895 tCO<sub>2</sub>e for the verification period. It was found that a complete set of data covering the monitoring period has been provided by the PPs. Activity levels and non-activity parameters have been monitored in accordance with the monitoring plan, 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 ACM0019 (version 01) and the PDD (Version 1.4, dated on 22/06/2012) as well as relevant tools applied.</p> <p>It was found that all emission factors, GWPs 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 all parameters are automatically collected by the DeltaV DCS provided by Emerson. It was found that there is no uncertainty related to manual transfer of data used in the calculation of emission reduction since the monitored parameters are automatically collected by the DeltaV DCS. All actions performed at the computer station are logged and the log file is available for KFQ. There were no errors in the digital transfer of data from DeltaV DCS files to the excel spreadsheets for the calculation of emissions reductions.</p> <p>It was found that the spreadsheets, including corresponding re-calculations of data during events as described in the MR, were made available completely by the PP and that all formulae have been correctly implemented and are accessible and traceable. Any recalculations are in line with the procedure in the registered PDD and have been checked and found to be correct and conservative. 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 calibrated equipment, and key data could be cross-checked via other sources (if applicable), such as raw data generated in the DCS, production log sheets and meters available in the operators control room or on-site. 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>
<b>Conclusion</b>	<p>KFQ confirms that all required data for calculation of the project GHG emissions were available for the whole verification period and no data were missing due to 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 PPs have followed appropriate methods and formulae for calculating project GHG emissions 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>

	KFQ confirms that the calculation of the project GHG emissions for the covered monitoring period is fully complete and based on suitable and verifiable evidence.
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**E.8.3. Calculation of leakage GHG emissions**

<b>Means of verification</b>	KFQ has checked, whether leakage emissions (if any) were determined by the PPs in accordance with the applied methodology, the PDD and the monitoring plan.
<b>Findings</b>	KFQ has found that the approach applied by the PPs that leakage emissions need not to be considered (i.e. being considered zero, consequently) is in accordance to the applied methodology ACM0019 (Version 01).
<b>Conclusion</b>	KFQ confirms that the PPs approach 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**

<b>Means of verification</b>	<p>KFQ has reviewed all data, parameters and calculations with respect to calculation of the GHG emission reductions and checked them against the requirements out of the applied methodology ACM0019 (Version 01) and the PDD (Version 1.4 per 22/06/2012) 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 PPs 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 production log sheets, meters available in the operators control room or on-site, 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>
<b>Findings</b>	<p>The GHG emission reductions have been found to be 77,092 tCO<sub>2</sub>e for the verification period. It was found that the first day on which CERs are being claimed in this verification period has been correctly specified by the PPs, being 27/05/2019.</p> <p>It was found that a complete set of data covering the monitoring period has been provided by the PPs. Activity levels and non-activity parameters have been monitored in accordance with the monitoring plan, 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 ACM0019 (Version 01) and the PDD (Version 1.4, dated on 22/06/2012) as well as relevant tools applied.</p> <p>It was found that all emission factors, GWPs 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 all parameters are automatically collected by the DeltaV DCS provided by Emerson. It was found that there is no uncertainty related to manual transfer of data used in the calculation of emission reduction since the monitored parameters are automatically collected by the DeltaV DCS. All actions performed at the computer station are logged and the log file is available for KFQ. There were no errors in the digital transfer of data from DeltaV DCS files to the excel spreadsheets for the calculation of emissions reductions.</p> <p>It was found that the spreadsheets, including corresponding re-calculations of data during events as described in the MR, were made available completely by the PP and that all formulae have been correctly implemented and are accessible and traceable. Any recalculations are in line with the procedure in the registered PDD and have been checked and found to be correct and conservative.</p> <p>Safeguarding procedures in accordance to the monitoring plan have been applied in a conservative way. Rounding of digits, where applicable, has been applied</p>

	<p>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 calibrated equipment, and key data could be cross-checked via other sources (if applicable), such as raw data generated in the DCS, production log sheets and meters available in the operators control room or on-site. 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. Findings 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>
<b>Conclusion</b>	<p>KFQ confirms that all required data for the calculation of GHG emission reductions were available for the whole verification period and no data were missing due to any non-monitoring of activity levels or non-activity parameters. KFQ confirms that suitable cross-checking of data was possible and has been performed as described.</p> <p>KFQ confirms that the PPs 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 emissions for the covered monitoring period is fully complete and based on suitable and verifiable evidence.</p> <p>KFQ confirms that the first day in which CERs are being claimed in the verification period is 27/05/2019, i.e. later than 31/12/2012. No pro-rata approach is applicable.</p> <p>KFQ finally confirms, that the amount of emission reductions claimed by the PPs for the verification period from 27/05/2019 to 18/08/2019, amounting to 77,092 tCO<sub>2</sub>e, is correctly determined and calculated.</p>

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

<b>Means of verification</b>	KFQ compared the ex-ante estimation of emission reductions in the registered PDD with the emission reductions reported by the PPs in the MR.
<b>Findings</b>	<p>The verification team found that the emission reductions in the PDD were estimated as 298,797 tCO<sub>2</sub>e for the year 2019 and corresponding estimation for the 84 days of the monitoring period is 68,764 tCO<sub>2</sub>e. However, the emission reductions reported by the PPs during the same period were 77,092 tCO<sub>2</sub>e which is higher than the amount estimated ex ante for this monitoring period in the PDD.</p> <p>It was found, that the PPs have correctly described the situation in the MR as well.</p>
<b>Conclusion</b>	<p>KFQ confirms that the reported emission reductions in the MR (v.01.1) are higher than estimated in the PDD.</p> <p>KFQ confirms that the emission reductions claimed by the PPs are reasonable.</p>

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

<b>Means of verification</b>	As determined in section E.8.5 above, the emission reductions of the project activity during the verification period are higher than emissions reductions estimated ex-ante in the PDD, KFQ has checked the respective explanation offered by the PPs in the monitoring period.
<b>Findings</b>	<p>During this monitoring period, a higher efficiency of the EnviNOx system was observed that estimate in the registered PDD and also there was no NA plant shutdown during the monitoring period.</p> <p>Therefore, KFQ considers emission reductions claimed in the monitoring period are reasonable.</p>
<b>Conclusion</b>	KFQ confirms that the explanation for the emission reductions of the project activity during the verification period is reasonable and that there are no non-conservative

	<p>aspects associated with it.</p> <p>Besides, KFQ confirms that there is no information on data and variables in the MR that is different from the registered PDD and would cause an increase in estimates of the emission reductions in the current monitoring period or in future monitoring periods.</p>
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#### **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**

<b>Means of verification</b>	The GHG emission reductions reported in the MR are 77,092 tCO <sub>2</sub> 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 PPs are correctly determined, reasonable and fairly stated and based on verifiable evidence and in accordance with the applied methodology and the registered PDD as well as applicable tools.
<b>Findings</b>	It was found that the project activity is implemented and operated according to the registered PDD and 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.
<b>Conclusion</b>	KFQ arrived at the conclusion that the GHG emission reductions reported in the MR and claimed by the PPs are correctly determined with 77,092 tCO <sub>2</sub> e for the covered verification period between 27/05/2019 to 18/08/2019. 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**

<b>Means of verification</b>	The PPs have 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.
<b>Findings</b>	N/A
<b>Conclusion</b>	N/A

#### **E.10. Global stakeholder consultation**

<b>Means of verification</b>	There were no comments received with regard to the stakeholder consultation conducted after the publication of the first monitoring report in accordance with the "CDM project cycle procedure for project activities", the section is therefore not applicable in this verification period.
<b>Findings</b>	N/A
<b>Conclusion</b>	N/A

**SECTION F. Internal quality control**

&gt;&gt;

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 PPs 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**

&gt;&gt;

Through the verification of the MR of the CDM project activity "Reduction of N<sub>2</sub>O emissions from the new nitric acid plant #5 of Hu-Chems Fine Chemical Corp." 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 1.4, 22/06/2012).
- The installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately.
- The monitoring plan is as per the applied methodology.
- The monitoring plan in MR is as per the monitoring plan in the registered PDD.
- The monitoring system and procedures comply with the monitoring system 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 MR (Version 01.1) 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	Reduction of N <sub>2</sub> O emissions from the new nitric acid plant #5 of Hu-Chems Fine Chemical Corp.
UNFCCC Reference Number	6637
Date of registration	17/07/2012
Registered PDD	22/06/2012 (Version 1.4)
Methodology applied	ACM0019 (Version 01)
Final version of Monitoring Report	01.1 (dated on 04/10/2019)
Crediting period	25/02/2013 to 24/02/2023
Monitoring period	27/05/2019 to 18/08/2019
Total GHG emission Reductions Verified	Baseline emissions: 80,987 tonnes CO <sub>2</sub> e Project emissions: 3,895 tonnes CO <sub>2</sub> e Leakage: 0 tonnes CO <sub>2</sub> e Emission reductions: <u>77,092 tonnes CO<sub>2</sub>e</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**

&gt;&gt;

Korean Foundation for Quality has performed the periodic verification of the emission reductions that have been reported for the CDM project activity "Reduction of N<sub>2</sub>O emissions from the new nitric acid plant #5 of Hu-Chems Fine Chemical Corp." (UNFCCC Registration Ref. No. 6637) for the period from 27/05/2019 to 18/08/2019.

The PPs 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 ACM0019 (Version 01), the registered PDD of 22/06/2012 (version 1.4), the validation report (dated 03/07/2012) and the MR (version 01.1) dated 04/10/2019. 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 that reported GHG emission reductions are fairly stated.

In our opinion, the GHG emissions reductions of the project activity "Reduction of N<sub>2</sub>O emissions from the new nitric acid plant #5 of Hu-Chems Fine Chemical Corp." (UNFCCC Registration Ref. No. 6637) for the period from 27/05/2019 to 18/08/2019 are fairly stated in the MR (version 01.1).

The data generation, aggregation, recording, calculation and reporting of GHG emission reductions were correctly conducted on the basis of the approved baseline and monitoring methodology ACM0019 (Version 01) and the monitoring plan in the registered PDD.

Hence, KFQ is able to certify that the emission reductions of the project activity "Reduction of N<sub>2</sub>O emissions from the new nitric acid plant #5 of Hu-Chems Fine Chemical Corp." during the period from 27/05/2019 to 18/08/2019 are 77,092 tCO<sub>2</sub>e.

**Signed on behalf of the Korean Foundation for Quality**Signature : 

Name : Yu Shim JEONG, Managing Director

Date : 17/10/2019



## Appendix 1. Abbreviations

Abbreviations	Full texts
AOR	Ammonia oxidation reactor
CAR	Corrective Action Request
CCP	Carbon Climate Protection GmbH
CDM	Clean Development Mechanism
CER	Certified Emission Reduction(s)
CL	Clarification Request
CMP	COP/MOP Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO <sub>2</sub>	Carbon dioxide
CO <sub>2e</sub>	Carbon dioxide equivalent
DCS	Distributed Control System
DOE	Designated Operational Entity
FAR	Forward Action Request
GC	Gas chromatography
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
Hu-Chems	Hu-Chems Fine Chemical Corp.
IPCC	Intergovernmental Panel on Climate Change
KFQ	Korean Foundation for Quality
KTL	Korean Testing Laboratory
MoC	Modalities of communication
MP	Monitoring Plan
MR	Monitoring Report
NA	Nitric Acid
N <sub>2</sub> O	Nitrous oxide
PDD	Project Design Document
PP	Project participant
PS	Clean Development Mechanism Project Standard
QMS	Quality Management System
SCR	Selective catalytic reduction
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:** 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:** Yeonggyeong 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
- 5.2 Captolactam, Nitric acid, Adipic acid
- 13.1 Solid waste and wastewater
- 15.1 Agriculture

She is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 5 July 2019.

Sustainability Management Institute  
Mi Jung LEE



## CERTIFICATE OF COMPETENCE

**Name:** Su Hyun PARK

**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
- 5.2 Captolactam, Nitric acid, Adipic acid
- 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 23 July 2019.

Sustainability Management Institute  
Mi Jung LEE



## CERTIFICATE OF COMPETENCE

**Name:** Jin Seok CHO

**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
- 13.1 Solid waste and wastewater
- 13.2 Manure
- 5.2 Captolactam, Nitric acid, Adipic acid

He is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 11 March 2019

Sustainability Management Institute  
Mi Jung LEE

## Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1	Project participants	Monitoring report: <ul style="list-style-type: none"> <li>Version 1.0: HUC-6637_MP16_MR_v01.0</li> <li>Version 1.1: HUC-6637_MP16_MR_v01.1</li> </ul>	From 02/09/2019  From 04/10/2019	Project participants
2	Project participants	CDM Project MS Excel Spreadsheet: <ul style="list-style-type: none"> <li>HUC6637_MP#16_UNFCCC_v1.0_CONFIDENTIAL</li> </ul>	From 02/09/2019	Project participants
3	Project participants	Shewhart control cards / QAL 3 records	From 27/05/2019 to 18/08/2019	Project participants
4	DeltaV / DCS System	Daily reports (PDF files, CSV files), Date trend curves	From 27/05/2019 to 18/08/2019	Project participants
5	DeltaV / DCS System	Daily event log files (TXT files)	From 27/05/2019 to 18/08/2019	Project participants
6	Project participants	CDM Project Design Document (Version 1.4)	22/06/2012 Published under: <a href="https://cdm.unfccc.int/Projects/DB/TUEV-SUED1341912725.05/view">https://cdm.unfccc.int/Projects/DB/TUEV-SUED1341912725.05/view</a>	Others
7	TUV SUD	Validation Report for the „Reduction of N2O emissions from the new nitric acid plant #5 of Hu-Chems Fine Chemical Corp.“ project. Report No. 600500803	03/07/2012 Published under: <a href="https://cdm.unfccc.int/Projects/DB/TUEV-SUED1341912725.05/view">https://cdm.unfccc.int/Projects/DB/TUEV-SUED1341912725.05/view</a>	Others
8	KFQ	Verification/Certification Report for the „Reduction of N2O emissions from the new nitric acid plant #5 of Hu-Chems Fine Chemical Corp.“ for the monitoring period from 17/02/2019 to 26/05/2019 (version 01.2)	08/07/2019 Published under: <a href="https://cdm.unfccc.int/Projects/DB/TUEV-SUED1341912725.05/iProcess/KFQ1559638569.83/view">https://cdm.unfccc.int/Projects/DB/TUEV-SUED1341912725.05/iProcess/KFQ1559638569.83/view</a>	Others
9	Project participants	Equipment list and specifications for all monitoring equipment and analyser - Plant Hu-Chems #5	All from 27/05/2019	Project participants
10	Emerson Process Management	Instruction Manual – NGA 2000 for MLT Analyzer (8 <sup>th</sup> Edition)	From August 2004	Project participants
11	UHDE GmbH	Performance Test Run protocol - Plant Hu-Chems #5	From 25/02/2013	Project participants
12	Project participants	Calibration gas (test gas) exchange History including all exchanges in the monitoring period	From 27/05/2019	Project participants
13	Airgas	Calibration gas records <ul style="list-style-type: none"> <li>Certificate concentration gas / EB0120602/ 1% Stability / Expiration on 25/03/2020</li> </ul>	From 25/03/2019	Project participants
14	EPMK <sup>2</sup> & Hu-Chems	Service Support Agreements: DeltaV system for EnviNOx® Hu-Chems as well as for Analyser systems for EnviNOx Hu-Chems between Hu-Chems Fine Chemical Corp. and	From 02/04/2013	Project participants

<sup>2</sup> EPMK refers to Emerson Process Management Korea Ltd. and is referred to in that way in the whole Appendix 3

		Emerson Process Management Korea Ltd.		
15	EPMK EPMK EPMK	Regular service reports: <ul style="list-style-type: none"> <li>Monthly Health Check report May 2019</li> <li>Monthly Health Check report June 2019</li> <li>Quarterly Health Check inspection report July 2019</li> </ul>	From 17/05/2019  From 19/06/2019  From 23/07/2019	Project participants
16	Hu-Chems	CDM Analyser cabinet check lists (Shift) & key list CDM Check sheets of EnviNOx system (daily)	From 27/05/2019 to 18/08/2019	Project participants
17	Hu-Chems	List of spare parts of monitoring system including provisions for re-purchasing	From 31/07/2019	Project participants
18	TÜV Rheinland Energie und Umwelt GmbH AIRTEC  AIRTEC  WOOJIN INC  Yokogawa Electric Korea  WOOJIN INC  TÜV Rheinland Energie und Umwelt GmbH AIRTEC  AIRTEC  MSC <sup>3</sup>  AIRTEC  Hu-Chems  AIRTEC	Calibration records & Certificates: <ul style="list-style-type: none"> <li>N<sub>2</sub>O Outlet Analyser (325-AT-5-018) – QAL1 Declaration of Conformity</li> <li>N<sub>2</sub>O Outlet Analyser (325-AT-5-018) – QAL2 Test Certification (performed on 27 to 29/02/2016, valid until 26/02/2021)</li> <li>N<sub>2</sub>O Outlet Analyser (325-AT-5-018) – AST Certification (Performed on 27/08/2018 to 29/08/2018)</li> <li>Nitric acid production flow meter (325-FT-5-609) – Calibration Certificate (performed on 09/05/2019, valid until 08/05/2024)</li> <li>Nitric acid temperature transmitter (325-TT-5-237) – Calibration Certificate (performed on 09/05/2019, valid until 08/05/2021)</li> <li>AOR Ammonia flow meter (325-FT-5-520) – Calibration Certificate (performed on 09/05/2019, valid until 08/05/2024)</li> <li>Tail gas flow meter (325-FT-5-522) – QAL1 Certification Statement</li> <li>Tail gas flow meter (325-FT-5-522) – QAL2 Test Certification (performed on 27 to 29/02/2016, valid until 26/02/2021)</li> <li>Tail gas flow meter (325-FT-5-522) – AST Certification (Performed on 27/08/2018 to 29/08/2018)</li> <li>Tail gas temperature transmitter (325-TT-5-161) Calibration record (performed on 09/05/2019, valid until 08/05/2021)</li> <li>Tail gas temperature transmitter (325-TT-5-161) – AST Certification (Performed on 27/08/2018 to 29/08/2018)</li> <li>Tail gas pressure transmitter (325-PT-5-362) – Monthly Calibration Certificate</li> <li>Tail gas pressure transmitter (325-</li> </ul>	From 05/03/2013  From 05/04/2016  From 16/11/2018  From 09/05/2019  From 09/05/2019  From 09/05/2019  From 05/03/2013  From 05/04/2016  From 16/11/2018  From 09/05/2019  From 16/11/2018  From 17/05/2019 to 12/08/2019  From 16/11/2018	Project participants

<sup>3</sup> MSC refers to Measurement Support Center Co. Ltd. and is referred to in that way in the whole Appendix 3

		PT-5-362) – AST Certification (Performed on 27/08/2018 to 29/08/2018)		
19	AIRTEC	QAL2 Test Certification Report (performed on 27 to 29/02/2016), including moisture content measurement records & report	From 05/04/2016	Project participants
20	AIRTEC	AST Certification Report (including moisture content measurement records & report) • Performed on 27/08/2018 to 29/08/2018	From 16/11/2018	Project participants
21	European Committee for Standardization (CEN)	EN 14181:2014 – Stationary source emissions – Quality assurance of automated measuring systems	From November 2014	Others
22	DURAG	Specification of Volume flow measuring system (D-FL 100)	From 30/05/2017	Project participants
23	Hu-Chems	Quality Management System (QMS) Documents • CDM Operation Management Procedure (HFC-I-EP0448, Rev. 5) • CDM Procedures for environment operation management (HFC-I- EP0446, Rev. 4)	From 12/06/2014  From 12/06/2014	Project participants
24	Hu-Chems	Hu-Chems CDM Training records • Held on 25/03/2019 to 29/03/2019	From March 2019	Project participants
25	Hu-Chems	Organizational structure	From February 2019	Project participants
26	Hu-Chems	Report on environmental regulations (N <sub>2</sub> O and NO <sub>x</sub> ): • From May 2019 • From June 2019 • From July 2019 • From August 2019	From 31/05/2019 From 30/06/2019 From 31/07/2019 From 31/08/2019	Project participants
27	Korean Foundation for Quality	ISO 9001:2015 Certificate, valid until 31/08/2020 ISO 14001:2015 Certificate, valid until 31/08/2020	From 29/08/2018  From 25/08/2018	Project participants
28	Hu-Chems	Internal audit records 2019	From 10/07/09	Project participants
29	Ministry of Environment	Clean Air Conservation Act of the Republic of Korea	From 15/01/2019 Published under: <a href="http://www.law.go.kr/%EB%B2%95%EB%A0%B9%EB%8C%80%EA%B8%B0%ED%99%98%EA%B2%BD%EB%B3%B4%EC%A0%84%EB%B2%95">http://www.law.go.kr/ %EB%B2%95%EB% A0%B9%EB%8C%8 0%EA%B8%B0%ED %99%98%EA%B2%B D%EB%B3%B4%EC %A0%84%EB%B2%9 5</a>	Others
30	Office for Government Policy Coordination	Framework Act on Low Carbon, Green Growth	From 31/12/2018 Published under: <a href="http://law.go.kr/lslInfoP.do?lsiSeq=206348&amp;efYd=20190401#0000">http://law.go.kr/lslInfoP .do?lsiSeq=206348&amp;e fYd=20190401#0000</a>	Others
31	Ministry of Environment	Act on the Allocation and Trading of Greenhouse-gas Emission Permits	From 16/10/2018 Published under: <a href="http://www.law.go.kr/lslInfoP.do?lsiSeq=204823&amp;efYd=20190117#0000">http://www.law.go.kr/l slInfoP.do?lsiSeq=204 823&amp;efYd=20190117 #0000</a>	Others



32	Ministry of Knowledge, Economy	Letter, confirming that Hu-Chems plants do not have an obligation from the relevant environmental regulations (Energy & GHG Target Scheme)	From 21/10/2011	Project participants
33	Ministry of Environment	Notification on emissions allocation to Hu-Chems Fine Chemical Corp.	From 31/10/2018	Project participants
34	Project participants	MoC Annex 2	From 05/04/2019 Published under: <a href="https://cdm.unfccc.int/Projects/DB/TUEV-SUED1163081212.47/view?cp=1">https://cdm.unfccc.int/Projects/DB/TUEV-SUED1163081212.47/view?cp=1</a>	Others
35	CDM Executive Board	<p>Methodology ACM0019 “N2O abatement from nitric acid production” (Version 01)</p> <p>Tool - Tool to determine the mass flow of a greenhouse gas in a gaseous stream, version 03.0</p> <p>Standards, Procedures &amp; Checklists</p> <ul style="list-style-type: none"> <li>• Standard – CDM validation and verification standard for project activities (Version 02.0)</li> <li>• Standard – CDM project standard for project activities (Version 02.0)</li> <li>• Standard – Sampling and surveys for CDM project activities and programme of activities (Version 07)</li> <li>• Procedure – CDM project cycle procedure for project activities (Version 02.0)</li> <li>• Guideline – Application of materiality in verifications (Version 02.0)</li> <li>• Checklist – Checklist for requests for issuance for project activities (Version 01.0)</li> <li>• Form - Monitoring report form (Version 07.0)</li> <li>• Form - Verification and certification report form for CDM project activities (Version 03.0)</li> </ul>	<p>From 03/06/2011 Published under: <a href="http://cdm.unfccc.int/methodologies/DB/HKCO7RKOQO748WNXJNDEW3BJT9XN8L">http://cdm.unfccc.int/methodologies/DB/HKCO7RKOQO748WNXJNDEW3BJT9XN8L</a></p> <p>From 27/11/2015 Published under: <a href="http://cdm.unfccc.int/Reference/tools/index.html">http://cdm.unfccc.int/Reference/tools/index.html</a></p> <p>From 29/11/2018</p> <p>From 29/11/2018</p> <p>From 04/05/2017</p> <p>From 29/11/2018</p> <p>From 20/02/2015</p> <p>From 30/08/2017</p> <p>From 31/05/2019</p> <p>From 31/05/2019 All published under: <a href="http://cdm.unfccc.int/Reference/index.html">http://cdm.unfccc.int/Reference/index.html</a></p>	Others

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

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

FAR ID	01	Section no.	E.2	Date: 02/10/2019
<b>Description of FAR</b>				
In accordance with paragraph 62(g) of the CDM Modalities and Procedure, the DOE contracted by the project participant to perform verification shall, "Identify and inform the project participants of any concerns related to the conformity of the actual project activity and its operation with the registered project design document. Project participants shall address the concerns and supply relevant additional information;" Hu-Chems is mandatory participant of the Greenhouse Gas and Energy Target Scheme and thus, the new nitric acid plant is one GHG emission source which has also been reported to the authority for target setting. The validation opinion is based on the current laws and regulations which are described in Validation Report. Any change of the Greenhouse Gas and Energy Target Scheme or other legislation which affects the project activity's emission reduction under CDM should be assessed by the verifying DOE.				
<b>Project participant response</b>				<b>Date: 04/10/2019</b>
Hu-Chems Environmental team regularly checks, if any regulation on N <sub>2</sub> O limitation is in place (relevant laws are the Clean Air Conservation Act and the Framework Act on Low Carbon, Green Growth). The relevant Acts show that no regulation of N <sub>2</sub> O limitation is in place which would restrict the emission of N <sub>2</sub> O in HuChems nitric acid plant #5. In addition, Korea government has started Korean ETS since 01/01/2015 as per the Act on the Allocation and Trading of Greenhouse-gas Emission Permits (13/03/2013). According to the Act, Hu-Chems Fine Chemical Corp. is designated as allocation entity, and there was a notification received from the Ministry of Environment that CDM projects are exempted from allocation. In conclusion, there is no legal requirement for Hu-Chems to reduce its N <sub>2</sub> O emissions.				
<b>Documentation provided by project participant</b>				
<ul style="list-style-type: none"> <li>• The Clean Air Conservation Act (latest version in January 2019)</li> <li>• The Framework Act on Low Carbon, Green Growth (latest version in December 2018)</li> <li>• Act on the Allocation and Trading of Greenhouse-gas Emission Permits (latest version in October 2018)</li> <li>• The confirmation letter from the Ministry of Knowledge and Economy (21/10/2011)</li> <li>• Notification on emissions allocation to Hu-Chems Fine Chemical Corp. by the ministry of environment (31/10/2018)</li> </ul>				
<b>DOE assessment</b>				<b>Date: 11/10/2019</b>
In addition to reviewing the latest reports by the Hu-Chems Environmental team, KFQ checked the relevant Korean environmental regulations including such, which could impact N <sub>2</sub> O emissions. In April 2010, new Korean regulations became effective (The Framework Act on Low Carbon, Green Growth), introducing the GHG and Energy Target Scheme. Hu-Chems nitric acid plant #5 does not have any target obligation on GHG emissions from this GHG and Energy Target Scheme. This was verified by the confirmation letter from the Ministry of Knowledge and Economy. The verification team have also checked Korean ETS has started since 01/01/2015 as per the Act on the Allocation and Trading of Greenhouse-gas Emission Permits. It was verified that CDM projects are exempted from allocation in Korean ETS through the notification on emissions allocation to Hu-Chems Fine Chemical Corp. by the Ministry of Environment. Thus, it is concluded that Hu-Chems nitric acid plant #5 have no obligation to reduce its N <sub>2</sub> O emissions, and there is no double counting of emission reductions for Hu-Chems nitric acid plant #5 due to Korean ETS. KFQ confirms, that there are currently no restrictions related to N <sub>2</sub> O emissions which have impact on the project activity and emission reduction calculations.				

**Table 2. CL from this verification**

CL ID	01	Section no.	E.7	Date: 02/10/2019
<b>Description of CL</b>				
According to MR version 01.0, date of last calibration of temperature transmitter for measuring nitric acid produced (P <sub>NA,n</sub> ) is 09/05/2019 and calibration frequency of it is 24 months. However, validity of last calibration is indicated as 08/05/2024 which is not 24 months frequency from last calibration.				
<b>Project participant response</b>				<b>Date: 04/10/2019</b>
PPs corrected the duration of valid calibration frequency and provided the revised MR (version 01.1).				
<b>Documentation provided by project participant</b>				
<ul style="list-style-type: none"> <li>• MR (Version 01.1)</li> </ul>				

<b>DOE assessment</b>	<b>Date:</b> 11/10/2019
The verification team has checked the revised MR (version 01.1) and confirmed that information of monitoring equipment including validity of last calibration is properly stated in the MR.	

Table 3. CAR from this verification

<b>CAR ID</b>	<i>n/a</i>	<b>Section no.</b>	<i>n/a</i>	<b>Date:</b> <i>n/a</i>
<b>Description of CAR</b>				
<i>n/a</i>				
<b>Project participant response</b>				<b>Date:</b> <i>n/a</i>
<i>n/a</i>				
<b>Documentation provided by project participant</b>				
<i>n/a</i>				
<b>DOE assessment</b>				<b>Date:</b> <i>n/a</i>
<i>n/a</i>				

Table 4. FAR from this verification

<b>FAR ID</b>	<i>n/a</i>	<b>Section No.</b>	<i>n/a</i>	<b>Date:</b> <i>n/a</i>
<b>Description of FAR</b>				
<i>n/a</i>				
<b>Project participant response</b>				<b>Date:</b> <i>n/a</i>
<i>n/a</i>				
<b>Documentation provided by project participant</b>				
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**Document information**

<i>Version</i>	<i>Date</i>	<i>Description</i>
03.0	31 May 2019	Revision to: <ul style="list-style-type: none"><li>• Ensure consistency with version 02.0 of the “CDM validation and verification standard for project activities” (CDM-EB93-A05-STAN);</li><li>• Make structural and editorial improvements.</li></ul>
02.1	11 January 2018	Editorial revision to correct the numbering of appendices in the instructions.
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