




**Validation report form for post-registration changes for
CDM project activities
(Version 02.0)**

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

BASIC INFORMATION

Title and UNFCCC reference number of the project activity	<ul style="list-style-type: none"> Title: Catalytic N₂O Abatement Project in the Tail Gas of the Nitric Acid Plant of the Hanwha Corporation (HWC) in Ulsan, Republic of Korea Reference number: 0922
Process track	<input type="checkbox"/> Prior approval <input checked="" type="checkbox"/> Issuance <input type="checkbox"/> Renewal of crediting period
Version number of the validation report on PRCs	Version 01.1
Completion date of the validation report on PRCs	02/01/2019
Type(s) of PRCs	<input type="checkbox"/> Temporary deviations from the registered monitoring plan, applied methodologies or applied standardized baselines <input checked="" type="checkbox"/> Corrections <input type="checkbox"/> Changes to the start date of the crediting period <input type="checkbox"/> Inclusion of a monitoring plan <input checked="" type="checkbox"/> Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools <input type="checkbox"/> Changes to the project design <input type="checkbox"/> Changes specific to afforestation and reforestation project activities
Version number of PDD to which this report applies	Version 14
Project participants	Hanwha Corporation (HWC)
Host Party	Republic of Korea
Applied methodologies and standardized baselines	<ul style="list-style-type: none"> Applied methodology: ACM0019 (version 02) (N₂O abatement from nitric acid production) No standardized baseline(s) applicable
Mandatory sectoral scopes linked to the applied methodology	<ul style="list-style-type: none"> Sectoral scope: 5-Chemical industries
Conditional sectoral scopes linked to the applied methodologies	<ul style="list-style-type: none"> No conditional sectoral scope(s) linked to the applied Methodology
Name and UNFCCC reference number of	<ul style="list-style-type: none"> Name: Korean Foundation for Quality (KFQ)

the DOE	• Reference number: E-0025
Name, position and signature of the approver of the validation report on PRCs	Soon Hong YEOM  Managing Director of Sustainability management institute

SECTION A. Executive summary

Korean Foundation for Quality (hereinafter “KFQ”) has been engaged by Hanwha Corporation (hereinafter “HWC”) to perform periodic verification of the CDM project “Catalytic N₂O Abatement Project in the Tail Gas of the Nitric Acid Plant of the Hanwha Corporation (HWC) in Ulsan, Republic of Korea (UNFCCC Registration Ref. No. 0922)” for 12th monitoring period from 27/08/2016 to 31/08/2017.

The project activity is to reduce N₂O emissions in the tail gas at nitric acid production process by installation of a DeN₂O catalyst in Onsan plant of HWC. The project activity introduces a tertiary N₂O abatement facility, physically located in the tail gas stream of the nitric acid plant.

The validation for the post-registration changes has been conducted in the course of the verification for the 12th monitoring period due to correction and permanent changes to the registered monitoring plan of a registered project activity were identified during on-site inspection. The correction and permanent changes to the registered monitoring plan are in line with Appendix of CDM Project Standard for project activities (version 02.0), hence, request for approval of the correction and permanent changes to the registered monitoring plan are submitted under this issuance track.

Validation Process

The validation process includes desk review of revised PDD (version 14.0) and other supporting documents. Further, on-site assessments and interviews with those involved in project management and operations are conducted. Draft validation report is prepared by summarizing desk review and on-site inspection findings (i.e. Raising CARs, CLs and FARs). Upon successful closing of the CARs and CLs raised (if any), the final PRC validation report for the correction and permanent changes is prepared. The final report then undergoes a technical review and final approval according to KFQ’s internal quality assurance procedures.

The information in the revised PDD provided by PP was assessed by review of the detailed project documentation as well as interviews with personnel at HWC and the consulting firm. This has enabled the validation team to assess and determine that the changes are in compliance with CDM Project Standard and relevant guidance provided by the Board.

General description of the project activity and permanent changes

Project Title	Catalytic N ₂ O Abatement Project in the Tail Gas of the Nitric Acid Plant of the Hanwha Corporation (HWC) in Ulsan, Republic of Korea	
UNFCCC Registration Number	0922	
Project Participant	Hanwha Corporation (HWC)	
Location of the project	Address	32, Sannam-gil, Onsan-eup, Ulju-gun, Ulsan city, Republic of Korea
	GPS Coordinates	Longitude: 129.3392106°E Latitude: 35.4139980°N
Date of registration	03 May 2007	
Crediting period	27/06/2014 ~ 26/06/2021 (2 nd crediting period)	
Registered PDD	Version 13 of 24/06/2016	
Revised PDD	Version 14 of 20/12/2018	

During this 12th monitoring period (27/08/2016 to 31/08/2017), there were post-registration changes (correction and permanent changes to the registered monitoring plan) identified as below:

- **For the correction**

: As per the applied methodology ACM0019 version 2, parameter ' $P_{production,y}$ ' which is production of nitric acid in year y used for calculation of baseline emissions. But in section of B.6. (Emission reductions) of registered PDD (version 13), the parameter is written as ' $P_{product,y}$ ' with typographical errors. So in order to be in accordance with the applied methodology, PP revised PDD (version 14) and corrected it as ' $P_{production,y}$ '.

- **For the permanent changes to the registered monitoring plan**

: According to the registered monitoring plan of PDD (version 13), nitric acid produced in year y ($P_{production,y}$) is calculated based on produced nitric acid flow and produced HNO_3 concentration. Flow of nitric acid is measured by a flow meter and information of the flow meter (i.e. instrument type, manufacture, model, accuracy level) is specified in the registered monitoring plan. However, during 12th monitoring period, there was flow meter change on 29 June 2017 and 05 February 2018 to prevent corrosion of meter and to conduct calibration respectively. So the information regarding a flow meter in the registered PDD is required to be changed permanently. Thus, PP revised PDD (version 14) and reflected information of a new installed flow meter.

In addition, as per registered monitoring plan the produced HNO_3 concentration has to be monitored to calculate nitric acid produce in year y but monitoring of HNO_3 concentration is not clearly provided in the registered PDD (ver.13.0). So PP decided to clarify monitoring method of the produced HNO_3 concentration in revised PDD (version 14).

Conclusion

As a result of our assessment, the correction and permanent changes to the registered monitoring plan described in the revised PDD (version 14.0) dated 20/12/2018 ensure that the correction/permanent changes are in accordance with the applied methodology and the changes to the project activity comply with the requirements established in the CDM Project Standard. The post-registration change in the project activity is in line with Appendix 1 of CDM project standard and hence does not require prior approval from EB. Thus an approval of PRC is requested under the issuance track.

SECTION B. Validation team, technical reviewer and approver

B.1. Validation 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	Validation findings
1.	Team Leader(*)	IR	LEE	Mi Jung	KFQ	√	√	√	√
2.	Verifier(*)	IR	JEONG	Yu Shim	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 validation report on PRCs

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	YOON	Sung Han	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 validation.

SECTION C. Means of validation**C.1. Desk/document review**

The PDD version 14.0 (hereinafter referred to as 'revised PDD') was submitted by the PP and it was reviewed as initial step of the validation process as for the post-registration changes. Also, over the whole validation period, validation team reviewed monitoring methodology and any other information and references relevant to the correction and permanent changes. A complete list of all documents reviewed is shown in Appendix 3 of this validation report. KFQ's validation process takes into consideration all the CDM Rules and Guidance 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 and other relevant decisions, clarifications and guidance from the CMP and the CDM EB.

C.2. On-site inspection

KFQ validation team performed an on-site inspection on 19/04/2018 for the periodic verification and PRC issues were identified in this process. Follow-up discussion with the project stakeholders to confirm selected information and to resolve issues identified in the document review. During the site visit and follow-up discussion, the personnel were interviewed or assisted the validation team.

The main topics of the discussion are summarized in the table below.

Duration of on-site inspection: 19/04/2018				
No.	Activity performed on-site	Site location	Date	Team member
1	Inspection of monitoring equipment and its specification	Onsan plant	19/04/2018	Mi Jung LEE Su Hyun PARK
2	Verification of the information regarding to the changes to the registered monitoring plan from documentation with other sources.	Onsan plant	19/04/2018	Mi Jung LEE Su Hyun PARK

C.3. Interviews

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

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	LEE	Gwang Yeol	HWC	19/04/2018	Facilities, instruments and analysis, QA/QC calculation	Mi Jung LEE Su Hyun PARK
2	PARK	Sung Gong	HWC	19/04/2018	General support	Mi Jung LEE Su Hyun PARK

3	HONG	Hye Jin	HWC	19/04/2018	General support	Mi Jung LEE Su Hyun PARK
4	KIM	Yeah Won	Roen Consulting Co., Ltd.	19/04/2018	CDM coordination	Mi Jung LEE Su Hyun PARK
5	Yoon	Dong Gil	Daekwang Inc.	14/12/2018	Monitoring equipment manufacture	Su Hyun PARK

C.4. Sampling approach

Not applicable to this PRC.

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

Areas of validation findings	No. of CL	No. of CAR	No. of FAR
Compliance with PDD form	0	0	0
Temporary deviations from the registered monitoring plan, applied methodologies or applied standardized baselines	0	0	0
Corrections	0	0	0
Changes to the start date of the crediting period	0	0	0
Inclusion of a monitoring plan	0	0	0
Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools	0	0	0
Changes to the project design	0	0	0
Changes specific to afforestation and reforestation project activities	0	0	0
Others (please specify)	0	0	0
Total	0	0	0

SECTION D. Validation findings

D.1. Compliance with PDD form

Means of validation	Comparing the PDD with the latest PDD template form (CDM-PDD-FORM, version 10.1) as well as reviewing with the instructions therein for filling out the PDD form.
Findings	<p>Regarding to the PRC, PP submitted revised PDD (version 14, dated on 20/12/2018) which is update version of registered PDD reflecting correction and permanent changes to the registered monitoring plan. The revised PDD has been provided both in tracked-changed and clean version. The validation team confirms that the revised PDD is completed by using the latest valid PDD form (version 10.1).</p> <p>Both registered (version 13) and revised (version 14) PDD were reviewed for the consistency of the information. The validation team found that in revised PDD section A.2. (location of project activity), section B.6.1. (explanation of methodological choices), section B.6.3 (ex-ante calculation of emission reductions), section B.7.1. (data and parameter to be monitored) and Appendix 7 (summary of post-registration changes) are mainly amended. Section A.2. is amended in order to comply instruction for completing valid PDD form. Section B.6.1., B.6.3. and B.7.1. are amended to reflect correction and permanent changes identified during 12th monitoring period. Appendix 7 is updated to reflect the PRC identified in 12th monitoring period.</p>
Conclusion	<p>The validation team confirms that the revised PDD completed by the PP is compliance with the latest valid form and instruction therein available at UNFCCC website.</p> <p>And the validation team confirms that the information transferred to the later valid</p>

	version of the PDD form is materially the same as that in the registered PDD.
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D.2. Temporary deviations from the registered monitoring plan, applied methodologies or applied standardized baselines

Means of validation	N/A
Findings	N/A
Conclusion	N/A

D.3. Corrections

Means of validation	The validation team conducted document review on these following documents combined with on-site inspection to validate the compliance of revised PDD as per following detail. <ul style="list-style-type: none"> - Registered PDD - Revised PDD - Appendix of CDM Project Standard version 02.0
Findings	As per the applied methodology ACM0019 version 2, parameter ' $P_{production,y}$ ' which is production of nitric acid in year y is used for calculation of baseline emissions. However, in section of B.6. (Emission reductions) of registered PDD (version 13), the parameter is written as ' $P_{product,y}$ ' with typographical errors. So in order to be in accordance with the applied methodology, PP revised PDD (version 14) and corrected typo of the parameter as ' $P_{production,y}$ '. The validation team reviewed the revised PDD against applied methodology and concluded that the corrected parameter is in accordance with the applied methodology ACM0019 version 2.
Conclusion	The validation team confirms that the corrected parameter is in accordance with the applied methodology ACM0019 version 2.0. Validation team confirms that the correction made by PP in a revised PDD comply with the relevant requirements in the CDM project standard for project activity. Furthermore, validation team conclude that the correction to the parameter does not affect the design of the project activity, so the correction is in line with appendix of CDM project standard for project activities (version 02.0).

D.4. Changes to the start date of the crediting period

Means of validation	N/A
Findings	N/A
Conclusion	N/A

D.5. Inclusion of a monitoring plan

Means of validation	N/A
Findings	N/A
Conclusion	N/A

D.6. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

Means of validation	The proposed changes to the registered monitoring plan is validated by the validation team as per para. 296~299 of VVS version 02.0. KFQ reviewed the revised PDD, registered PDD, applied methodology and the supporting documents referenced in the findings below.
Findings	According to the registered monitoring plan of PDD (version 13), nitric acid produced in year y ($P_{production,y}$) is calculated based on produced nitric acid flow and produced HNO_3 concentration. There are two permanent changes to the registered monitoring plan which one is of flow meter of nitric acid production and the other is of concentration of nitric acid production as below: <u>(1) Flow meter of nitric acid production</u> Flow of nitric acid produced is measured by a flow meter and information of the flow

meter (i.e. instrument type, manufacture, model, accuracy level) is described in the registered monitoring plan. However, during 12th monitoring period, there was flow meter change on 29 June 2017 and 05 February 2018 to prevent meter corrosion and to conduct calibration of the previous flow meter. So the information of the flow meter in the registered PDD is required to be changed permanently.

	Registered PDD (version 13)	Revised PDD (version 14)
Instrument type	Coriolis Mass Flow Measuring System	Coriolis Mass Flow Measuring System
Manufacture	Endress + Hauser	EMERSON
Model	Proline Promass 80I	CMF200L518N2BIEZZZ
Accuracy class Mass flow liquids	0.15	0.1
Period of use	27/08/2016~29/06/2017	29/06/2017~present

PP revised PDD (version 14) and reflected information of a new installed flow meter.

The validation team checked installation of new meters during site tour of on-site inspection and reviewing daily working log of HWC to check date of meter change. The validation team also checked information of the flow meter in revised PDD against its nameplate and its specifications provided by manufacturer, EMERSON. Also the validation team checked accuracy level ($\pm 0.10\%$ of rate) of a new meter and identified that new meter has a higher accuracy level thus validation team could confirm that this change does not reduce the level of accuracy of the monitoring compared with the requirements contained in the registered monitoring plan.

(2) Concentration of nitric acid production

Although concentration of nitric acid produced has to be monitored for calculation of the amount of nitric acid produced, monitoring and QA/QC method of the HNO_3 concentration was not specified in the registered monitoring plan of PDD (version 13). Thus, PP decided to revise registered monitoring plan to provide clear monitoring plan of it. PP described the information of monitoring HNO_3 concentration in revised PDD as below:

	Revised PDD (version 13) section B.7.1. – $P_{\text{production},y}$	Revised PDD (version 14) section B.7.1. – $P_{\text{production},y}$
Measurement methods and procedures	Monitoring frequency of $P_{\text{production},y}$ (daily) is only provided.	Nitric acid concentration is determined by specific gravity method based on measured values using specific gravity hydrometer and thermometer in HWC's laboratory.
Monitoring frequency		<p><Specific gravity> Instrument type: Specific gravity hydrometer</p> <ul style="list-style-type: none"> Accuracy: $\pm 0.002\text{kg/m}^3$ <p><Temperature></p> <ul style="list-style-type: none"> Instrument type: Liquid-in-glass thermometer Accuracy: $\pm 1^\circ\text{C}$
QA/QC procedures		Monitoring and Recording frequency: daily Calibration of specific gravity hydrometer and thermometer will be performed according to manufacturer's

		recommendation refer to national regulation
	<p>According to the revised PDD (Version 14.0), PP will monitor HNO₃ concentration by laboratory analysis that conduct by qualified staffs of HWC according to HWC's internal standard for testing HNO₃. The laboratory staffs have been assessed their competency of management of measuring instrument in accordance with HWC internal regulation. The staffs measure specific gravity and temperature of HNO₃ produced on a daily basis using a specific gravity hydrometer and a thermometer. To determine HNO₃ concentration, specific gravity method is applied with daily measured specific gravity and temperature. This approach is designed by nitric acid plant engineering company, UHDE and validation team checked it through technical standard provide by UHDE. HWC uses data of specific gravity and temperature of HNO₃ measured at noon by default to determine HNO₃ concentration of the day. In case data at noon was not available, HWC compares two alternative nearest measurement data from the noon (before PM 12:00 and after) and adopts conservative value. The validation team checked that HWC manages HNO₃ concentration in constant level with no significant change during a period of normal operation in order to maintain product quality. And also above mentioned method of determination of HNO₃ concentration is well reflected in HWC's internal manual.</p> <p>For the specific gravity hydrometer and thermometer, it will also calibrate according to manufacturer's recommendation that comply with national regulation, 'Framework Act on National Standards' and 'Enforcement Rule on operation accreditation system of national calibration institutes'.</p> <p>The validation team reviewed HWC's internal standard for testing HNO₃ and HWC's CDM monitoring manual of this project activity to check its implementation within HWC and validation team could confirm that monitoring plan changed mentioned above is well reflected. Also the validation team interviewed personnel of monitoring equipment manufacturer (Daekwang Inc.) which provides specific gravity hydrometer and thermometer to HWC's nitric acid plant in order to cross check the information provided in the revised PDD and couldn't find any inconsistency against the information provided by PP to the verification team.</p> <p>As a result, based on the information made available to us, the validation team concluded that the change does not reduce the level of accuracy of the monitoring compared with the requirement contained in the registered monitoring plan.</p>	
Conclusion	<p>The validation team confirms that the permanent changes to the registered monitoring plan comply with the relevant requirements in the CDM project standard for project activities.</p> <p>And the validation team confirms that these permanent changes to the registered monitoring plan are in compliance with the applied methodology. Also the validation team concluded that the permanent changes do not reduce the level of accuracy of the monitoring compared with the requirements contained in the registered monitoring plan. The validation team confirms that changes have correctly been reflected in the revised PDD.</p>	

D.7. Changes to the project design

Means of validation	N/A
Findings	N/A
Conclusion	N/A

D.8. Changes specific to afforestation and reforestation project activities

Means of validation	N/A
Findings	N/A
Conclusion	N/A

SECTION E. Internal quality control

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

SECTION F. Validation opinion

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Korean Foundation for Quality (KFQ) has performed a validation for post registration changes of 'Catalytic N₂O Abatement Project in the Tail Gas of the Nitric Acid Plant of the Hanwha Corporation (HWC) in Ulsan, Republic of Korea (UNFCCC Registration Ref. No. 0922)'. The post registration changes have been validated in line with all relevant UNFCCC requirements for the CDM.

The validation is based on the revised PDD (ver. 14), applied methodology (ACM0019, Version 2.0) and the information made available to us. The review of the revised PDD, relevant supporting documents, and the subsequent follow-up interviews have been conducted to determine the post-registration changes of the project activity meet all relevant UNFCCC requirements for the CDM.

The validation team confirms the corrected parameter is in accordance with the applied methodologies and the registered monitoring plan. Also, the validation team confirms that the permanent changes to the registered monitoring plan are in compliance with the applied methodology and do not reduce the level of accuracy of the monitoring. And the validation team confirms that the permanent changes are not likely to lead to a reduction in the accuracy of the calculation of GHG emission reductions. The correction and permanent changes from the registered monitoring plan are in line with Appendix of CDM Project Standard for project activities (version 02.0). Hence, request for approval of the correction and permanent changes from the registered monitoring plan is submitted under this issuance track.

As a result of our assessment, KFQ confirms that the changes comply with the relevant requirements related to the correction and permanent changes from the registered monitoring plan in the CDM Project Standard for project activities (ver. 02.0).

Therefore, KFQ requests that the post-registration changes from the project activity as described in the registered PDD for the project activity 'Catalytic N₂O Abatement Project in the Tail Gas of the Nitric Acid Plant of the Hanwha Corporation (HWC) in Ulsan, Republic of Korea' to be considered by the Board.

Signed on behalf of the Korean Foundation for Quality

Signature : 

Name : Soon Hong YEOM, Managing Director

Date : 02 January 2019

Appendix 1. Abbreviations

Abbreviations	Full texts
ACM	Approved consolidated methodology
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CL	Clarification Request
CMP	COP/MOP Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
DOE	Designated Operational Entity
EB	Executive Board
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse gas
HWC	Hanwha Corporation
KFQ	Korean Foundation for Quality
MoV	Means of Verification
MR	Monitoring Report
PDD	Project Design Document
PP	Project Participant
PRC	Post Registration Change
PS	Clean Development Mechanism Project Standard
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: Yu Shim JEONG

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
- 5.1 Chemical Industry
- 5.2 Caprolactam, nitric acid, adipic acid
- 11.1 Emission of Fluorinated gases
- 11.2 Refrigerant gas production

She is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 16 May 2016

Sustainability Management Institute
Sang Yeon PARK



CERTIFICATE OF COMPETENCE

Name: Su Hyun PARK

Qualification:

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

Scopes of Expertise:

Technical Area (TA)

1.2 Renewables

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

Sustainability Management Institute
Mi Jung LEE

CERTIFICATE OF COMPETENCE

Name: Sung Han YOON

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
- 5.1 Chemical Industry
- 5.2 Caprolactam, nitric and adipic acid
- 11.1 Emissions of fluorinated gases
- 11.2 Refrigerant gas production
- 13.1 Solid waste and wastewater
- 13.2 Manure

He is approved as the qualification above according to the KFQ's procedure of Qualifying and Maintaining of Auditor on 16 May 2016.

Sustainability Management Institute
Sang Yeon PARK



Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1	HWC	CDM Project Design Document of “Catalytic N ₂ O Abatement Project in the Tail Gas of the Nitric Acid Plant of the Hanwha Corporation (HWC) in Ulsan, Republic of Korea” (UNFCCC Registration Ref. No. 0922)	Version 13 (Registered PDD, 24/06/2016) http://cdm.unfccc.int/Projects/DB/TUEV-SUED1170949600.29/view	Project participants
2			Version 14.0 (Revised PDD, 20/12/2018)	
3	CDM Executive Board	CDM Validation and Verification Standard for project activities	Version 02.0 (29/11/2018)	Others
4		CDM Project Standard for project activities	Version 02.0 (29/11/2018)	
5		CDM project cycle procedure for project activities	Version 02.0 (29/11/2018)	
6	CDM Executive Board	ACM0019 “N ₂ O abatement from nitric acid production”	Version 2.0 (31/05/2013)	Others
7	CDM Executive Board	Project design document form (CDM-PDD-FORM)	Version 10.1 (28/06/2017) http://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20180413113815210/Reg_Form05.doc	Others
8	HWC	Daily working log	29/06/2017, 05/02/2018	Project participants
9	HWC	Purchasing inquiry of HNO ₃ flow meter (EMERSON)	05/09/2016, 03/01/2017	Project participants
10	EMERSON	Product Data Sheet (Specifications of HNO ₃ flow meter)	PS-00374, Rev. AC (November 2015)	Project participants
11	HWC	Internal standard for testing HNO ₃	HWO-C-101 Version 01 (01/06/2005)	Project participants
12	UHDE	Operation manual - Technical standard for determination of HNO ₃ concentration	July 1992	Project participants
13	HWC	CDM Monitoring Manual	Version 8 (December 2018)	Project participants
14	Ministry of Trade, Industry and Energy	Framework Act on National Standards	13/12/2018	Others
15	Korean Agency for Technology and Standard	Enforcement Rule on operation accreditation system of national calibration institutes	25/10/2016	Others

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

Table 1. CLs from this validation

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

Table 2. CARs from this validation

CAR ID	N/A	Section no.		Date: -
Description of CAR				
Project participant response				Date: -
Documentation provided by project participant				
DOE assessment				Date: -

Table 3. FARs from this validation

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