



South Asia

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# Verification and Certification Report

of the Registered CDM Project

“Catalytic N<sub>2</sub>O destruction project at the new nitric acid plant  
PANNA 4 of Enaex S.A.”

UNFCCC reference number: 5393

Monitoring Period #06: 01/01/2014 to 31/12/2014

Report No.: 00876HA

**19 May 2015**

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Date of first issue of this report	20/03/2015
Revision No. of this report	1
Registered PDD (version/date)	Version 1.2 - 28/09/2011
Registration date	30/11/2011
Revised PDD	Version 1.4 - 17/09/2014
Methodology (title; number; version)	N2O abatement from nitric acid production; ACM0019; Version 02.0
Crediting period	19/12/2011 to 18/12/2021(fixed)
Published Monitoring Report (version/date)	Version 1 - 23/02/2015
Final Monitoring Report (version/date)	Version 2 - 27/04/2015
Scope	5
Technical Area	5.1
Location of the Project	Barrio Industrial s/n; Mejillones, Antofagasta, Chile GPS coordinates: -23.097400 , -70.430153
Project Participant	Enaex S.A. (contractor) Carbon Climate Protection GmbH Mitsubishi Corporation Nordic Environment Finance Corporation (valid from 15/09/2014 onwards)
Project Documentation Link	<a href="http://cdm.unfccc.int/Projects/DB/RWTUV1320421146.84/view">http://cdm.unfccc.int/Projects/DB/RWTUV1320421146.84/view</a>

### VERIFICATION AND CERTIFICATION CONCLUSION

TÜV SÜD South Asia Pvt. Ltd. has performed the periodic verification of the aforementioned CDM project activity. The verification is based on the currently valid documentation of the United Nations Framework Convention on Climate Change (UNFCCC).

The management of Enaex S.A. is responsible for the preparation of the GHG emissions data and the reported GHG emission reductions on the basis set out within the project's Monitoring Plan indicated in the revised PDD and the applied methodology.

The verifier can confirm that:

- the development and maintenance of records and reporting procedures are in accordance with the registered monitoring plan;
- the project is operated as planned and described in the project design document approved by the EB;
- the installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately;
- the monitoring system is in place and generates GHG emission reductions data;
- the GHG emission reductions are calculated without material misstatements;
- the monitoring plan in Monitoring Report is as per the PDD and monitoring plan approved by the EB;
- the monitoring plan in the approved PDD is as per the applied methodology;
- There is an audit trail that contains the evidence and records that validate the stated figures.

Based on the information we have seen and evaluated, we confirm that the project activity achieved the verified amount of reductions in anthropogenic emissions by sources of greenhouse gases that would not have occurred in the absence of the project activity.

Verified emission reductions in this monitoring period: 162 335 tCO<sub>2e</sub>

Baseline: 337 004 tCO<sub>2e</sub>

Project emissions: 174 668 tCO<sub>2e</sub>

Leakage: 0 tCO<sub>2e</sub>

Pune, 19/05/2015



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Eswar Murty  
Member of Certification Body "Environment  
and Energy" TÜV SÜD South Asia

## Abbreviations

<b>ACM</b>	Approved Consolidated Methodology
<b>CAR</b>	Corrective Action Request
<b>CDM</b>	Clean Development Mechanism
<b>CDM-EB</b>	CDM Executive Board
<b>CER</b>	Certified Emission Reduction
<b>CMP</b>	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
<b>CO<sub>2e</sub></b>	Carbon dioxide equivalent
<b>CR / CL</b>	Clarification Request
<b>DNA</b>	Designated National Authority
<b>DOE</b>	Designated Operational Entity
<b>EF</b>	Emission Factor
<b>EIA / EA</b>	Environmental Impact Assessment / Environmental Assessment
<b>ER</b>	Emission Reduction
<b>FAR</b>	Forward Action Request
<b>GHG</b>	Greenhouse Gas(es)
<b>GWP</b>	Global Warming Potential
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>IRL</b>	Information Reference List
<b>KP</b>	Kyoto Protocol
<b>MP</b>	Monitoring Plan
<b>MR</b>	Monitoring Report
<b>PCP</b>	Project Cycle Procedure
<b>PDD</b>	Project Design Document
<b>PP</b>	Project Participant
<b>PS</b>	Project Standard
<b>TÜV SÜD</b>	TÜV SÜD South Asia Pvt. Ltd
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>VVS</b>	Clean Development Mechanism Validation And Verification Standard

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## 1 METHODOLOGY

### 1.1 Objective

TÜV SÜD has been commissioned by the aforementioned client to perform an independent verification assessment.

The objective of the verification work is to comply with the requirements of paragraph 62 of the CDM Modalities and Procedures. According to this assessment TÜV SÜD shall:

- ensure that the project activity has been implemented and operated as per the registered PDD and that all physical features (technology, project equipment, monitoring and metering equipment) of the project are in place,
- ensure that the published MR and other supporting documents provided are complete, verifiable and in accordance with applicable CDM requirements,
- ensure that the actual monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan and the approved methodology,
- evaluate the data recorded and stored as per the applicable requirements.

### 1.2 Scope

The verification scope encompasses an independent and objective review and ex-post determination of the monitored reductions in GHG emissions by the Designated Operational Entity. The verification is based on the submitted monitoring report, the validated project design documents including its monitoring plan and validation report, previous verification reports (if any), the applied monitoring methodology, relevant decisions, clarifications and guidance from the CMP and the EB and any other information and references relevant to the project activity's resulting emission reductions. These documents are reviewed against the requirements of the Kyoto Protocol, the CDM Modalities and Procedures and related rules and guidance.

Based on the requirements in the VVS, TÜV SÜD has applied a rule-based approach for the verification of the project. The principles of accuracy, completeness, relevance, reliability and credibility were combined with a conservative approach to establish a traceable and transparent verification opinion.

The verification considers both quantitative and qualitative information on emission reductions.

The verification is not meant to provide any consultancy towards the client. However, stated requests for clarifications, corrective and/or forward actions may provide input for improvement of the monitoring activities.

### 1.3 Verification Process

The information provided by the project participants is assessed by applying the means of verification specified in the VVS and in the absence of specific means of verification specified in the VVS the standard auditing techniques are applied.

Once TÜV SÜD receives the Monitoring Report and a confirmation from any PP to upload, the MR is made publicly available through a dedicated interface on the UNFCCC CDM website.

A competent assessment team is selected prior to the start of the verification. The team is selected to cover the technical area(s), sectoral scope(s) and relevant host country experience for evaluating the CDM project activity. Additionally a competent Technical Reviewer or Technical Reviewer Team is appointed to conduct checks on quality and completeness.

The verification team performs first a desk review, followed by an on-site visit, which results in the formation of a draft report and a list of findings. The next step involves the evaluation of the findings through direct communication with the PPs and then finally the preparation of the

verification report. This verification report and other supporting documents then undergo an internal quality control by the CB “Environment and energy” before submission to the CDM-EB.

## 1.4 Appointment of the Team

According to the technical scopes and experiences in the sectoral or national business environment, TÜV SÜD has composed an assessment team in accordance with the appointment rules of the TÜV SÜD Certification Body “Environment and Energy”.

The composition of an assessment team has to be approved by the Certification Body (CB) to assure that the required skills are covered by the team. The CB of TÜV SÜD operates the following qualification levels for team members that are assigned by formal appointment rules:

- Assessment Team Leader (ATL);
- Verifier (V);
- Verifier Trainee (T);
- Technical Experts (TE);
- Country expert (CE);
- Technical reviewer (TR).

It is required that the sectoral scope(s) and the technical area(s) (TA) linked to the methodology/ies and project have to be covered by the assessment team. Appointment certificates of the selected team members are attached to this report as Annex.

### Assessment Team:

Name	Qualification	Scope	Technical Area	Host country experience	Onsite visit
Hammer, Martin	ATL	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> (All)	-	-
Tausche, Konrad	V, TE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> (All)	-	<input checked="" type="checkbox"/>

### Technical Reviewer:

Name	Qualification	Scope	Technical area
Castro, Javier	TR	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> (All)

## 1.5 Review of Documents

Publication has been initiated before the verification activities started. Based on the published MR the assessment team performed a desk review to:

- verify the completeness of the data and the information presented in the MR,
- check the compliance of the MR with respect to the monitoring plan depicted in the registered PDD and verify that the applied methodology was carried out. Particular attention to the frequency of measurements, the quality of the metering equipment including calibration requirements, and the quality assurance and quality control procedures was paid,
- 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.

A complete list of all documents reviewed is available in the Information Reference List attached as Annex 2 to this report.

## 1.6 On-site Assessment and follow-up Interviews

During on-site visit (dates of on-site visit 18/03/2015 – 19/03/2015) TÜV SÜD performed a physical site inspection and interviewed project stakeholders to:

- confirm the implementation and operation of the project,
- review the data flow for generating, aggregating and reporting the monitoring parameters,
- confirm the correct implementation of procedures for operations and data collection,
- cross-check the information provided in the MR documentation with other sources,
- check the monitoring equipment against the requirements of the PDD and the approved methodology, including calibrations, maintenance, etc.,
- review the calculations and assumptions used to obtain the GHG data and ER,
- identify if the quality control and quality assurance procedures are in place to prevent or correct errors or omissions in the reported parameters.

A list of all persons interviewed is included in the IRL attached as Annex 2 to this report.

## **1.7 Resolution of Clarification and Corrective and Forward Action Requests**

The objective of this phase of the verification is to resolve the requests for corrective actions, clarifications, and any other outstanding issues which need to be clarified for TÜV SÜD's conclusion on the achieved emission reductions. The CARs and CRs raised by TÜV SÜD are resolved during communication between the client and TÜV SÜD. To guarantee the transparency of the verification process, the concerns raised and responses that have been given are documented in detail in the List of Findings that is attached as Annex 1 to this report.

## **1.8 Internal Quality Control**

Internal quality control within the team is assured by means of a technical review process that takes place after the on-site assessment and after closure of findings. The internal quality control in the verification process is given by the final decision (Verification and Certification Conclusion) made by the CB "Environment and Energy".



## 2 REPORTING REQUIREMENTS

In the following sections, the results of the verification are stated. The verification results relate to the project performance as documented and described in the revised PDD and final Monitoring Report. The verification findings for each verification subject are presented below.

### 2.1 FARs from Validation / Previous Verification

The verification team confirms that all FARs presented in the validation report and/or previous verification reports have been correctly addressed by the PPs.

<b>Requests from Validation</b>	During the first verification process, the verifier shall check that appropriate training has been carried out among the people involved in the project.
Summary of project owner response	Evidence of appropriate training of the people involved in the project was provided to the assessment team.
Conclusion	<input checked="" type="checkbox"/> This Finding has been closed during 1 <sup>st</sup> Verification.

<b>Requests from 1<sup>st</sup> Verification</b>	After identification of a problem in the programming of automatic QAL3 procedure, PPs switched to manual QAL3 mode in the first monitoring period. When switching back to automatic QAL3 mode, sufficient evidences on the proper functioning of automatic QAL 3 shall be provided.
Summary of project owner response	N/A as discussed during onsite visit.
Conclusion	<input checked="" type="checkbox"/> This Finding has been closed during 2 <sup>nd</sup> Verification

<b>Requests from 4<sup>th</sup> Verification</b>	<p>The N<sub>2</sub>O analyser can be operated in two different measurement ranges (range1: 0...200 ppm and range 2: 0... 2000 ppm). There is no alarm in the system that is activated when the measurement goes from one range to the other. However, the system is prepared for identifying both ranges and different paths are taken by the system. During this verification period, this situation has been verified and all the data is correctly used.</p> <p>Nonetheless, there is no recording of those events in order to confirm when the system takes one way or the other.</p> <p>PPs shall record which measuring range was used by the analyser.</p>
Summary of project owner response	The N2O outlet concentration is manually recalculated using the QAL2 parameters. All values above 200 ppm are recalculated using the parameters for the range 0 – 2000 ppm and all values below use the parameters from the range 0 – 200 ppm. The range changes from 0 – 2000 ppm to 0 – 200 ppm whenever the N2O concentration falls below 180 ppm. These changes of range will be recorded.

Conclusion	As PPs respond: the changes of range shall be transparently recorded. <b>The FAR 01 remains open.</b>
Summary of project owner response	The range changes are recorded by DCS operator when the N <sub>2</sub> O concentration exceed 200 ppm (range 0 – 2000) or falls below 180 ppm (range 0 – 200) and are included in calculation spreadsheet. Furthermore, it was included a calculation for vi,t,db using the factors derived from the calibration curve of QAL2 for each range.
Conclusion	During onsite visit the procedure was still not completely implemented. During next verification the verifier shall pay attention to the records of the DCS operator. <b>The FAR 01 remains open.</b>

<b>Requests from 5<sup>th</sup> Verification</b>	During the on-site visit it has been observed that the value recorded for the production of nitric acid is high, while the plant is not in operation. The technical reason of this failure shall be analysed for the next monitoring period. This issue has been observed only since the last stop of plant, hence has no effect on the actual monitoring period.
Summary of project owner response	The flowmeter is calibrated for Nitric Acid. When the plant is in shutdown, all the lines are blow-ing using steam. In the passing for the flowmeter, this can vibrate by sensor and transmits the flow, although the plant is out of service. This behavior ends when the valves up-stream and down-stream are closed. Is important to note that all the other variables involved in calculation of Emission Reductions are not valid during the plant shutdowns.
Conclusion	The issue has been discussed during onsite audit and the relevant data has been reviewed. The issue has been reasonably explained. It can also be confirmed that during this event the plant was in shutdown and no emission reductions were claimed. <div style="text-align: center;">☑</div> This Finding has been closed during this Verification

## 2.2 Project Implementation in accordance with the registered Project Design Document

The project is fully implemented according to the description presented in the registered PDD. The verifier confirms, through the visual inspection that all physical features of the proposed CDM project activity including data collecting systems and storage have been implemented in accordance with the registered PDD. The project activity is completely operational and the same has been confirmed during the on-site visit. Some shut downs of the nitric acid plant occurred during this monitoring period, but the secondary N<sub>2</sub>O abatement system (project activity) was never removed or out of operation.

The difference in the values does not lead to a substantial increment of the ER in this period and it is not expected that it will lead to an increment in future periods in relation to the estimates in the registered PDD.

## 2.3 Compliance of the Monitoring Plan with the Monitoring Methodology

The EB approved a request for post-registration changes (revised PDD version 1.4 dated on 17/09/2014) on 22/10/2014. The revised PDD applies approved methodology ACM0019 version 02.0. The monitoring plan is in accordance with this approved methodology applied by this CDM project activity.

## 2.4 Compliance of the Monitoring with the Monitoring Plan

The monitoring has been carried out in accordance with the monitoring plan contained in the revised PDD. All parameters were monitored and determined as per the Monitoring Plan.

Data transfer from meters to the monitoring report is realized as follows:

The instruments transmitters convert the primary sensing signal (resistance, voltage, Infrared light, etc.) to a 4 - 20 mA analogue signal according to range and units configured. These signals are hardwired transmitted to I/O cards (analogue input cards) and collected by the DeltaV Processor. These digital values are made available in the fibre optics network to be processed, among others, in controller blocks, other variables calculations and DeltaV Continuous Historian Server (CHS). Modifications of the Delta V, which are protected by security levels by the supplier, are tracked by a Version Control Tool. The CHS is installed in the ProPlus station where the information of field process variables are stored. The hourly averages (.csv-files) were manually transferred to the Excel Calculation Tool followed by a quality procedure.

To calculate the Emission Reductions, two Excel Files are available.

- Step 1: Transfer to the Excel Tool. No manual recalculations applied.
- Step 2 Calculation based on the transferred data according to the applied methodology and tool and any manual recalculation.

The verification of the parameters required by the monitoring plan is provided as follows:

<b>Data / Parameter:</b>	P <sub>production,y</sub>
<b>Data unit:</b>	tHNO <sub>3</sub>
<b>Description:</b>	Production of nitric acid in year y
<b>Source of data used:</b>	<p>The coriolis type mass flow meter and the integrated density measurement device deliver values, which are used as basis for calculation of the concentration (taking into consideration the measured temperature of the nitric acid). The nitric acid at 100% is calculated by multiplying the mass flow with the concentration. Then nitric acid produced is automatically recorded in the Delta V system and provided as hourly averages in Excel sheet which is derived from Delta V system (csv.files).</p> <p>The equipment used has been calibrated according to the requirements specified by the approved monitoring plan of the revised PDD. The instruments are calibrated according to the manufacturer's specification (IRL 6a, 6c). The calibration certificates were provided as evidence of the calibration work performed (IRL 7a, 7e). Hence it is confirmed that calibration was not delayed.</p>
<b>Means of verification/Comments:</b>	Data provided in the raw data sheet and raw data to calculate HNO <sub>3</sub> concentration (IRL 9b) were traced by the verifier with the help graphs over the whole period. In case of peculiarities the graph was zoomed and checked with special awareness taking into consideration the specific

	<p>operation of the facility as demonstrated by other related parameter to verify explanations given. The reported data found to be consistent with the ProPlus graphs.</p> <p>DeltaV Monthly reports (.mdi-files) (IRL 9a) were used to verify correct transfer of raw data to the Excel Tool.</p>
Cross-check	<p>PPs provided daily production data for this monitoring period "Listado de Producciones Diarias Planta Prillex América" (IRL 12b) that includes data recorded manually once every day from Foxboro DCS . The verifier could crosscheck reported nitric acid production of the monitoring period in MR with this data source. The difference was found to in a reasonable range.</p> <p>In addition the calculation of HNO<sub>3</sub> concentration (based on density and temperature of HNO<sub>3</sub> produced) has been crosschecked with empirical values of HNO<sub>3</sub> temperature, density and concentration.</p> <p>In order to ensure the integrity of the data, the verification team reviewed the series of hourly data in parallel with other parameters including to make graphs in the Excel file calculation sheets submitted, e.g. to see peculiarity in the graph shape, to check the similarity between nitric acid produced and to see the overall integrity of oxidation temperature.</p> <p>The nitric acid plant has a designed capacity (= nameplate capacity) of 925 mtpd HNO<sub>3</sub> (100%) according to PDD. This has been confirmed by the plant supplier Técnicas Reunidas (IRL 4i). Further, it has also been confirmed by the plant supplier that reserves were necessarily incorporated during plant design. The actual capacity shall not be understood as overproduction of nitric acid, but as exploitation of state-of-the-art reserves in the plant design.</p> <p>The highest daily production rate during this period did not exceed the design margins mentioned by the plant supplier (IRL 4i).</p>

<b>Data / Parameter:</b>	$h_v$
<b>Data unit:</b>	h
<b>Description:</b>	Number of hours of operation in year y
<b>Source of data used:</b>	<p>According to PDD the hours of operation are determined by the oxidation Temperature in the AOR.</p> <p>The temperature is reported automatically by three independent measurement points (TAG numbers TT-45030A – C) measuring the temperature at the same time. The value of the instrument with the TAG number TT-45030A was selected as main signal for monitoring the operation temperature; TT-45030B and TT-45030C are used as back-up signals in case TT-45030A is not fully functional.</p> <p>The oxidation temperature is automatically recorded in the Delta V system and provided as hourly averages in Excel sheet which is derived from Delta V system (csv.files).</p> <p>Type: digital (DCS)</p> <p>The plant is considered to be in operation when the temperature is in a range from 850°C to 905°C. The range has been validated (IRL 1b).</p> <p>The equipment used has been calibrated according to the requirements of as specified by the approved monitoring plan of the registered PDD. The instruments are calibrated according to the manufacturer's specification (IRL 6b). The calibration certificate was provided as evidence of the calibration work performed (IRL 7d). Hence it is confirmed that calibration was not delayed.</p>
<b>Means of verification/Comments:</b>	<p>Data provided in the raw data sheet were traced by the verifier with the help of ProPlus graphs over the whole period. In case of peculiarities the graph was zoomed and checked with special awareness taking into consideration the specific operation of the facility as demonstrated by other related parameter to verify explanations given.</p> <p>DeltaV Monthly reports (.mdi-files) (IRL 9a) were used to verify correct transfer of raw data to the Excel Tool.</p>

Cross-check	To cross-check the data the values of the three thermocouples TT-45030A TT-45030B and TT-45030C were compared to each other. The values were found to be consistent over the period. The mock values recorded during shut down (CAR 01) were not counted for $h_v$ .
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<b>Data / Parameter:</b>	$h_{r,y}$
Data unit:	h
Description:	Number of hours (h) in year y where for secondary any $N_2O$ abatement: abatement system was not installed, underperformed or failed
Source of data used:	<p>This parameter is determined by applying Case 2 for the calculation of <math>h_{r,y}</math> defined in the applied methodology. Case 2 is applicable as the project has never applied AM0028 or AM0034.</p> <p>Thus the relevant monitoring parameters for determining <math>h_{r,y}</math> are:</p> <p> <math>F_{N_2O,tail\ gas,h}</math> → Monitoring Parameters <math>V_{t,db}</math> <math>V_{i,t,db}</math> <math>C_{H_2O,t,db,n}</math>  <math>P_{NA,h}</math> → Monitoring Parameter <math>P_{production,y}</math>  <math>EF_{new,y}</math> → fixed ex ante </p>
Means of verification/Comments:	The verifier has checked the compliance of the calculation applied with the defined equation in the methodology. For the means of verification of the underlying parameters refer to the table of the relevant monitoring parameter.
Cross-check	n/a: For the crosscheck of the underlying parameters please refer to the table of the relevant monitoring parameter.

<b>Data / Parameter:</b>	$V_{t,db}$
Data unit:	m <sup>3</sup> dry gas/h
Description:	Volumetric flow of the gaseous stream in time interval t on a dry basis
Source of data used:	<p>The total gas volume is continuously measured by a DURAG DFL 100 DS and automatically recorded in the Delta V system and the data is provided as hourly averages in Excel sheet which is derived from Delta V system (csv.files).</p> <p>The equipment used has been calibrated according to the requirements as specified by the applied methodology.</p> <p>The correction factors derived from the calibration curve for the monitoring components as determined during the QAL2-test in accordance with EN14181 are applied to both the <math>N_2O</math> concentration and the volume flow of the tail gas. The QAL2 parameters are applied to the calculated hourly averages as part of the calculation of project emissions in the Excel calculation tool (IRL 10). This is in accordance with the applied methodology.</p> <p>The QAL2 reports (IRL 7b) was provided as evidence of the calibration work performed. Hence it is confirmed that calibration was not delayed. In addition the AST was performed in accordance with the applicable standard EN14181 by an accredited third party institute.</p>
Means of verification/Comments:	<p>Data provided in the raw data sheet were traced by the verifier with the help of ProPlus graphs over the whole period. In case of peculiarities the graph was zoomed and checked with special awareness taking into consideration the specific operation of the facility as demonstrated by other related parameter to verify explanations given.</p> <p>The DeltaV monthly reports (.mdi-files) (IRL 9a) were used to verify correct transfer of raw data to the Excel Tool.</p>
Cross-check	In order to ensure the integrity of the data, the verification team reviewed the series of hourly data in parallel with other parameters including to make graphs in the Excel file calculation sheets submitted, e.g. to see peculiarity in the graph shape, to check the similarity between nitric acid produced and tail gas flow, to see the overall integrity of oxidation temperature. The data were



	found to be plausible.
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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>	<p>The volumetric fraction of N<sub>2</sub>O is continuously measured by a non-dispersive infrared photometry for N<sub>2</sub>O and automatically recorded in the Delta V system and provided as hourly averages in Excel sheet which is derived from Delta V system (csv.files).</p> <p>The equipment used has been calibrated according to the requirements as specified by the applied methodology. The correction factors derived from the calibration curve for the monitoring components as determined during the QAL2-tests in accordance with EN14181 are applied to both the N<sub>2</sub>O concentration and the volume flow of the tail gas. The QAL2 parameters are applied to the calculated hourly averages as part of the calculation of project emissions in the Excel calculation tool (IRL 10). This is in accordance with the applied methodology. The QAL2 reports (IRL 7b) provided as evidence of the calibration work performed. Hence it is confirmed that calibration was not delayed.</p>
<b>Means of verification/Comments:</b>	<p>Data provided in the raw data sheet were traced by the verifier with the help of ProPlus graphs over the whole period. In case of peculiarities the graph was zoomed and checked with special awareness taking into consideration the specific operation of the facility as demonstrated by other related parameter to verify explanations given.</p> <p>DeltaV Monthly reports (.mdi-files) (IRL 9a) were used to verify correct transfer of raw data to the Excel Tool.</p> <p>In regard to applied default values in case measurement data are not available, the verifier confirms that the procedure according to the applied methodology is correctly applied.</p>
<b>Cross-check</b>	In order to ensure the integrity of the data, the verification team reviewed the series of hourly data in parallel with other parameters including to make graphs in the Excel file calculation sheets submitted, e.g. to see peculiarity in the graph shape, to check the similarity between nitric acid produced and tail gas flow and N <sub>2</sub> O concentration. The data were found to be plausible.

<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>	<p>The temperature of tail gas is continuously measured by a PT 100 resistance thermometer and automatically recorded in the Delta V system and provided as hourly averages in Excel sheet which is derived from Delta V system (csv.files).</p> <p>The equipment used has been calibrated according to the requirements of as specified by the applied methodology. The instruments are calibrated according to the manufacturer's specification (IRL 6d).</p> <p>The calibration certificate (IRL 7c) was provided as evidence of the calibration work performed.</p> <p>Hence it is confirmed that some calibration activities were delayed (IRL 7c). Due to this delay on the calibrations the procedure defined in §283 from the VVS has been correctly applied in order to correct the measured values (refer also CAR 01).</p>
<b>Means of verification/Comments:</b>	<p>Data provided in the raw data sheet were traced by the verifier with the help of ProPlus graphs over the whole period. In case of peculiarities the graph was zoomed and checked with special awareness taking into consideration the specific operation of the facility as demonstrated by other related parameter to verify explanations given.</p> <p>DeltaV Monthly reports (.mdi-files) (IRL 9a) were used to verify correct transfer of raw data to the Excel Tool.</p>

Cross-check	In order to ensure the integrity of the data, the verification team reviewed the series of hourly data in parallel with other parameters including to make graphs in the Excel file calculation sheets submitted, e.g. to see peculiarity in the graph shape, to check the similarity between nitric acid produced and tail gas flow and N <sub>2</sub> O concentration. The data were found to be plausible.
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<b>Data / Parameter:</b>	P <sub>t</sub>
<b>Data unit:</b>	Pa
<b>Description:</b>	Pressure of the gaseous stream in time interval t
<b>Source of data used:</b>	<p>Static and atmospheric pressure data are continuously measured by capacitive pressure transducers and data is automatically recorded in the Delta V system and provided as hourly averages in Excel sheet which is derived from Delta V system (csv.files).</p> <p>DeltaV Monthly reports (.mdi-files) (IRL 9a) were used to verify correct transfer of raw data to the Excel Tool.</p> <p>The equipment used has been calibrated according to the requirements as specified by the applied methodology (i.e. the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream") and according to the requirements of the manufacturer's specification (IRL 6d).</p> <p>The calibration certificates (IRL 7f, IRL 7g) were provided as evidence of the calibration work performed.</p> <p>In regard to the delayed calibrations the verifier has checked the calibration certificates and manufacturers specification of the instruments. Hence the verifier can confirm in accordance with VVS (IRL 2g) para 283 and para 284 that (a) the results of the delayed calibration do not show any errors (IRL 7f and IRL 7g), (b) the error is smaller than the maximum permissible error indicated by the instrument manufacturer (IRL 6i), (c) the error has been applied in a conservative manner (IRL 10b), (d) all measured hourly values taken during the period between the scheduled date of calibration and the actual date of calibration (IRL 10b, IRL 7f and IRL 7g).</p>
<b>Means of verification/Comments:</b>	<p>Data provided in the raw data sheet were traced by the verifier with the help of ProPlus graphs over the whole period. In case of peculiarities the graph was zoomed and checked with special awareness taking into consideration the specific operation of the facility as demonstrated by other related parameter to verify explanations given.</p> <p>DeltaV Monthly reports (.mdi-files) (IRL 9a) were used to verify correct transfer of raw data to the Excel Tool.</p> <p>During those hours where the instruments were out of operation due to calibration activities, PPs have applied downtime procedure according to the applied methodology as verified by reviewing the formulas applied in the Excel calculation tool (IRL 10b).</p>
Cross-check	In order to ensure the integrity of the data, the verification team reviewed the series of hourly data of static pressure in parallel with other parameters including to make graphs in the Excel file calculation sheets submitted, e.g. to see peculiarity in the graph shape, to check the similarity between nitric acid produced and tail gas flow and N <sub>2</sub> O concentration. The data were found to be plausible except from 11/03/2014 12:00 until 24/04/2014 05:00 (refer to CAR 01). In this period the data have been treated as erroneous and the procedure described in the applied methodology has been applied to correct the mass flow of N <sub>2</sub> O.

<b>Data / Parameter:</b>	C <sub>H<sub>2</sub>O,t,db,n</sub>
<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 USEPA CF 42 method 4 – Gravimetric determination of water content (QAL2 or AST Report).

Means of verification/Comments:	Option A of the tool can be applied, as the moisture content is less than 0.05 kg H <sub>2</sub> O/m <sup>3</sup> dry gas. The highest measured value according to AST report from 2014 (IRL 8c) is 0.0024 kgH <sub>2</sub> O / m <sup>3</sup> dry gas (= 2,400 mgH <sub>2</sub> O/m <sup>3</sup> dry gas) and the highest value according to latest QAL2 report (IRL 7b) is 0.0028 kg H <sub>2</sub> O/m <sup>3</sup> dry gas (= 2,800 mg H <sub>2</sub> O/m <sup>3</sup> dry gas).
Cross-check	The validating DOE mentions (IRL 1b): <i>In the mass balance, the expected moisture content given by the technology supplier at design operation conditions is far below 0.05 kgH<sub>2</sub>O/m<sup>3</sup> dry gas. Although the mass balance is given for design operating conditions not considering the presence of the secondary catalyst, this value is deemed to be acceptable since the secondary catalyst only affects the composition of the gas in terms of N<sub>2</sub>O.</i> The moisture content measured during AST by third party is in compliance with the observations of validating DOE.

## 2.5 Assessment of Data and Calculation of Greenhouse Gas Emission Reductions

All data has been available and all the parameters have been monitored in accordance with the registered monitoring plan. Conservative default values and values from back up meter have been used in accordance with the registered monitoring plan as explained above in chapter 2.4. The reported data have been cross-checked against other sources available as explained above in chapter 2.4.

The verifier confirms that the methods and formulae used to obtained the baseline, project and leakage emissions are appropriate. The same has been done in accordance with the methods and formulae described in the registered monitoring plan and applicable methodology.

The verifier confirms that the monitoring report includes all parameters and the monitored data at the intervals required by the methodology and PDD.

The verifier confirms that all the emission factors and default values (ex-ante values from PDD) have been correctly justified. No assumptions have been applied by the project participant. All the emission factors and default values are explicitly mentioned in the monitoring report.

The emission reductions achieved during this monitoring period are less than estimated in PDD. The amount of emission reductions of the final monitoring period is lower compared to the initial amount reported in the published Monitoring Report version 1. This is a result of CAR01.



**Ex-ante values from PDD – not monitored parameters**

<b>Data / Parameter:</b>	$EF_{new,y}$
Data unit:	kgN <sub>2</sub> O/tHNO <sub>3</sub>
Description:	Baseline N <sub>2</sub> O emission factor for nitric acid production in year y (related to 100 per cent pure acid)
Source of data used:	According to PDD and ACM0019 version 02.0.0
Means of verification/Comments:	The applied emissions factors have been compared with the default value given in the PDD and applied methodology. The correct values are applied.
Cross-check	Not applicable

<b>Data / Parameter:</b>	GWP <sub>N<sub>2</sub>O</sub>
Data unit:	tCO <sub>2</sub> e/tN <sub>2</sub> O
Description:	Global warming potential of N <sub>2</sub> O valid for the commitment period
Source of data used:	According to PDD - Relevant decisions by the CMP
Means of verification/Comments:	The applied value is in accordance with “Standard for application of the global warming potentials to CDM project activities and PoAs for the second commitment period of the Kyoto Protocol (version 01.0)”
Cross-check	Not applicable

<b>Data / Parameter:</b>	R <sub>u</sub>
Data unit:	Pa.m <sup>3</sup> /kmol.K
Description:	Universal ideal gases constant
Source of data used:	According to PDD and “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 02.0.0)
Means of verification/Comments:	The applied value has been compared with the default value given in the PDD and applied methodology. The correct value is applied.
Cross-check	Not applicable

<b>Data / Parameter:</b>	MM <sub>i</sub>
Data unit:	kg/kmol
Description:	Molecular mass of N <sub>2</sub> O
Source of data used:	According to PDD and “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 02.0.0)
Means of verification/Comments:	The applied value has been compared with the default value given in the PDD and applied methodology. The correct value is applied.
Cross-check	Not applicable

## **Annex 1**

### **List of Findings**

# List of Findings - Compilation and Resolutions

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Definitions contained in the Glossary of CDM terms and applied in the Standard	
<b>Shall / Should / May</b>	In addition to the definitions contained in the Glossary of CDM terms, the following terms apply in the VVS: <u>Shall</u> is used to indicate requirements to be followed; <u>Should</u> is used to indicate that among several possibilities, one course of action is recommended as particularly suitable; <u>May</u> is used to indicate what is permitted.
<b>Credible</b>	Information is credible if it is authentic and is able to inspire belief or trust, and the willingness of persons to accept the quality of evidence.
<b>Reliable</b>	Information is reliable if the quality of evidence is accurate and credible and able to yield the same results on a repeated basis.
<b>CAR</b>	The DOE shall raise a CAR if one of the following situations occur: (a) Non-compliance with the monitoring plan or methodology are found in monitoring and reporting and has not been sufficiently documented by the project participants, or if the evidence provided to prove conformity is insufficient; (b) Modifications to the implementation, operation and monitoring of the registered project activity has not been sufficiently documented by the project participants; (c) Mistakes have been made in applying assumptions, data or calculations of emission reductions that will impact the quantity of emission reductions; (d) Issues identified in a FAR during validation to be verified during verification or previous verification(s) have not been resolved by the project participants.
<b>CL</b>	The DOE shall raise a CL if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.
<b>FAR</b>	The DOE shall raise a FAR during verification for actions if the monitoring and reporting require attention and/or adjustment for the next verification period.

## List of Findings - Compilation and Resolutions

Project Title:

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Forward Action Requests by the assessment team <b>from previous period</b>		
	Comments and Results	
Issue	<p>The N<sub>2</sub>O analyser can be operated in two different measurement ranges (range1: 0...200 ppm and range 2: 0... 2000 ppm). There is no alarm in the system that is activated when the measurement goes from one range to the other. However, the system is prepared for identifying both ranges and different paths are taken by the system. During this verification period, this situation has been verified and all the data is correctly used.</p> <p>Nonetheless, there is no recording of those events in order to confirm when the system takes one way or the other.</p>	<b>FAR 01 remains open</b>
Requirement	Applied methodology ACM 0019 version 1: The correction factors derived from the calibration curve of the QAL2 audit for the monitoring components as determined during the QAL2-test in accordance with EN14181 must be applied to both the N2O concentration and the volume or mass flow of the tail gas.	
Forward Action Request	<p><b><u>Forward Action Request No. 1</u></b></p> <p>PPs shall record which measuring range was used by the analyser.</p>	
Response	The N <sub>2</sub> O outlet concentration is manually recalculated using the QAL2 parameters. All values above 200 ppm are recalculated using the parameters for the range 0 – 2000 ppm and all values below use the parameters from the range 0 – 200 ppm. The range changes from 0 – 2000 ppm to 0 – 200 ppm whenever the N <sub>2</sub> O concentration falls below 180 ppm. These changes of range will be recorded.	
Means of verification	As PPs respond: the changes of range shall be transparently recorded. The FAR 01 remains open.	
Response	The range changes are recorded by DCS operator when the N2O concentration exceed 200 ppm (range 0 – 2000) or falls below 180 ppm (range 0 – 200) and are included in calculation spreadsheet. Furthermore, it was included a calculation for vi,t,db using the factors derived from the calibration curve of QAL2 for each range.	
Means of verification	<i>During next verification the verifier shall pay attention to the records of the DCS operator. The FAR remains open.</i>	
Any resulting	N/A	

## List of Findings - Compilation and Resolutions

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Forward Action Requests by the assessment team <b>from previous period</b>		
changes in the monitoring report or supporting annexes		
Forward Action Requests by the assessment team <b>from previous period</b>		
	Comments and Results	
Issue	During the on-site visit it has been observed that the value recorded for the production of nitric acid is high, while the plant is not in operation. The technical reason of this failure shall be analysed for the next monitoring period. This issue has been observed only since the last stop of plant, hence has no effect on the actual monitoring period.	<input checked="" type="checkbox"/> This Finding is closed
Requirement	The DOE shall raise a FAR during verification for actions if the monitoring and reporting require attention and/or adjustment for the next verification period.	
Forward Action Request	<b><u>Forward Action Request No. 2</u></b>  PPs shall clarify the issue during next verification #06.	
Response	The flowmeter is calibrated for Nitric Acid. When the plant is in shutdown, all the lines are blowing using steam. In the passing for the flowmeter, this can vibrate by sensor and transmits the flow, although the plant is out of service. This behavior ends when the valves up-stream and down-stream are closed. Is important to note that all the other variables involved in calculation of Emission Reductions are not valid during the plant shutdowns.	
Means of verification	The issue has been discussed during onsite audit and the relevant data has been reviewed. The issue has been reasonably explained. It can also be confirmed that during this event the plant was in shutdown and no emission reductions were claimed.	
Any resulting changes in the monitoring report or supporting annexes	None	

## List of Findings - Compilation and Resolutions

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### Compilation and Resolutions of CARs, CRs and FARs

Corrective Action Requests by the assessment team		
	Comments and Results	Conclusion and IRL
Issue	<p>A. The calibration date for instruments PT 45091 and PT 45095 reported for March throughout the MR and Excel Calculation File is not consistent with the calibration certificates.</p> <p>B. TT-45093 Date of calibration: 22/08/2012 Validity: 21/08/2014. The validity of the calibration work provided in the MR has expired.</p> <p>C. During shut down period in July /August the TT-45030A (oxidation temperature) provided high values for 30/07/2014 and 31/07/2014 that pretend plant being in operation. The hours are counted for h<sub>y</sub>.</p> <p>D. Between 11/03/2014 12:00 and 24/04/2014 05:00 the atmospheric pressure values dropped to a level which is not realistic.</p>	<p>☑</p> <p>This Finding is closed</p> <p>IRL 1h</p> <p>IRL 10b</p> <p>IRL 7f</p> <p>IRL 7g</p> <p>IRL 7c</p> <p>IRL 6j</p>
Requirement	<p>VVS 18d: In carrying out its validation and verification work, the DOE shall:</p> <p>Assess the accuracy, conservativeness, relevance, completeness, consistency, and transparency of the information provided by project participants.</p>	
Corrective Action Request	<p><b><u>Corrective Action Request No.1</u></b></p> <p>A. The MR and Excel File shall provide correct calibration dates and the procedure for delayed calibration shall be applied on the correct calibration dates.</p> <p>B. The information on calibration work performed shall cover the complete monitoring period. Any calibration certificate for calibration works performed shall be provided to the assessment team.</p> <p>C. Mock values shall not be counted for the h<sub>y</sub>.</p> <p>D. The period of incorrect atmospheric pressure need to be corrected according to the requirements.</p>	
Response	<p>A. The calibration dates for instruments PT – 45091 and PT – 45095 were correctly pro-</p>	

## List of Findings - Compilation and Resolutions

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Corrective Action Requests by the assessment team		
	<p>vided now and the procedure for calibration was applied on correct calibration dates.</p> <p>B. The information on calibration works performed covers now the complete monitoring period and all relevant calibration certificates for calibration works performed were provided. The information regarding the calibration of TT – 45093 was updated and provided. The values for <math>T_i</math> were corrected using conservative criteria.</p> <p>C. Mock values were excluded and are not counted for the <math>h_y</math>.</p> <p>D. The period of incorrect atmospheric pressure was corrected according to the requirements. Due to a failure in calibration of atmospheric pressure during this monitoring period, the maximum value for <math>F_{N_2O}</math> was applied according to conservative criteria.</p>	
Assessment Means of verification	<p>The assessment team has reviewed</p> <p>A) the revised MR (IRL 1h) and Excel File (IRL 10b) with special focus on the calibration dates for instruments PT 45091 and PT 45095. The dates have been found to be in compliance with the calibration certificates (IRL 7f and IRL 7g).</p> <p>B) <i>This issue remains open</i>  <i>TT-45093: Evidence of the maximum permissible error indicated by the instrument manufacturer and results of the delayed calibration shall be provided</i></p> <p>C) the revised Excel File (IRL 10b) with special focus on the shut down period in July /August. The mock values during the shutdown period were manually corrected. The values are consistently reported in the revised MR (IRL 1h).</p> <p>D) the revised MR (IRL 1h) and Excel File (IRL 10b) with special focus on atmospheric pressure data. The data in the period 11/03/2014 12:00 and 24/04/2014 05:00 has been treated as erroneous and the procedure described in the applied methodology has been applied to correct the mass flow of <math>N_2O</math>.</p>	
Response	B) Regarding the point B) the evidences of the maximum permissible error indicated by the instrument manufacturer and results of delayed calibration were provided.	
Assessment Means of verification	<p>B) The information has been provided.</p> <p>The verifier has checked the certificates (IRL 7c), and manufacturers specification of the instrument (IRL 6j). Hence the verifier can confirm in accordance with VVS para 283 and para 284 that (a) the results of the delayed calibration do not show any errors, (b) the error is smaller</p>	

## List of Findings - Compilation and Resolutions

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Corrective Action Requests by the assessment team		
	than the maximum permissible error indicated by the instrument manufacturer (c) the applied error value has been applied in a conservative manner, (d) all measured hourly values taken during the period between the scheduled date of calibration and the actual date of calibration.	
Changes in the monitoring report or supporting annexes	Changes described as above. The amount of CER has been reduced especially because of D).	
Corrective Action Requests by the assessment team		
	Comments and Results	Conclusion and IRL
Issue	<p>A. The table used in Annex 1 of the MR to provide the contact information of project participant Nordic Environment Finance Corporation is not in accordance with the MR template form.</p> <p>B. Non of PPs listed in Annex 1 is indicated to be responsible for completing the CDM-MR-FORM.</p>	<div>☑</div> <p>This issue is closed</p> <p>IRL 1h</p>
Requirement	MR template shall not be altered	
Corrective Action Request	<b><u>Corrective Action Request No.2</u></b> The MR template has to be used and correctly filled.	
Response	The tables mentioned in Annex 1 regarding the information about the Project Participants were checked and corrected.	
Assessment Means of verification	The verifier has reviewed the revised MR (IRL 1h) with special focus on the table used in Annex 1 of the MR to provide the contact information of project participants. The table was found to be correctly filled.	
Changes in the monitoring report or supporting annexes	Minor correction in the MR (IRL 1h) as described above.	

	Comments and Results	Conclusion and IRL
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## List of Findings - Compilation and Resolutions

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Issue	Date of penultimate AST Test: 23/10/2013 – 25/10/2013 Date of last AST Test: 12/11/2014 – 13/11/2014 During onsite audit PPs provided an email correspondence with AST service supplier that shows that the reason of this “delay” is caused by the service provider.	<input checked="" type="checkbox"/> This issue is closed IRL 11b
Requirement	According to EN14181, AST is an annual test.	
Corrective Action Request	<b><u>Corrective Action Request No.3</u></b> The MR shall provide a reason for this delay.	
Response	The delay in the AST was due to the availability of the service provider (Airtec GmbH). The service was requested in August 2014. However, considering the unavailability of AIRTEC’s technical personnel and instruments, the AST was performed in week 46/2014 (November 12 <sup>th</sup> and 13 <sup>th</sup> ). As evidence e-mails of the conversation and respective dates of coordination between ENAEX and Airtec GmbH were provided.	
Assessment Means of verification	The verifier has reviewed the email correspondence between ENAEX and AIRTEC (IRL 11b) that shows a clear intention from ENAEX for a timely AST and explains the delay of the service.	
Changes in the monitoring report or supporting annexes	None	

Clarification Requests by the assessment team		
	Comments and Results	Conclusion and IRL
Issue	A. The N <sub>2</sub> O abatement rate was significantly increased after the shut down by beginning of August. During onsite visit PPs explained this by improvement works at the secondary catalyst.  B. During the period of dropped atmospheric pressure level (described also in CAR 1) the tail gas flow showed simultaneously an increased level.	<input checked="" type="checkbox"/> This issue is closed IRL 11c IRL 11d IRL 11e
Requirement	VVS 18d: In carrying out its validation and verification work, the DOE shall:	

## List of Findings - Compilation and Resolutions

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Clarification Requests by the assessment team		
	Assess the accuracy, conservativeness, relevance, completeness, consistency, and transparency of the information provided by project participants.	
Clarification Request	<p><b><u>Clarification Request No. 1</u></b></p> <p>A. PPs shall provide evidences on the works performed that resulted in the increased abatement rate of the secondary catalyst.</p> <p>B. PPs shall clarify why the tail gas flow relate to the atmospheric pressure.</p>	
Response	<p>A. The evidences of secondary catalyst refill (that results in an increase of N<sub>2</sub>O abatement) were provided.</p> <p>B. During this period the atmospheric pressure problems with its calibration occurred, and the increased level of tail gas is due to a higher plant load.</p>	
Assessment Means of verification	<p>A) The assessment team has reviewed the provided supporting evidences (IRL 11c and IRL 11d). Both indicating a modification in the secondary N<sub>2</sub>O catalyst that explains the significantly increased abatement rate after the shut down by beginning of August.</p> <p>B) The assessment team has reviewed (IRL 11e) which shows a plant load of increased plant load during that period.</p>	
Changes in the monitoring report or supporting annexes	None	

## **Annex 2**

### **Information Reference List**

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**Project title:** Catalytic N2O destruction project at the new nitric acid plant PANNA 4 of Enaex S.A.” (UNFCCC Ref-Nr. 5393)

**Interviewed Persons during onsite assessment:**


Name	Function	Company
Carlos Araneda	Process Engineer	ENAEX S.A.
Josefina Diaz	CDM Team Support	ENAEX S.A.

**Other Interviewed Persons (during onsite assessment via Web Conference):**


Name	Function	Company
Sonja Bichler	Project Manager	Carbon Climate Protection GmbH

Information Reference List	Verification of CDM Project	Page 2 of 9	
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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date	Additional Information (Relevance in CDM context)
1	ENAE S.A. TÜV SÜD TÜV NORD	<b><u>Monitoring Report, Project Design Documents, Previous Verification Reports</u></b> <ul style="list-style-type: none"> <li>a. PDD of the CDM Project “Catalytic N2O destruction project at the new nitric acid plant PANNA 4 of Enaex S.A.” (CDM Registration N° 5393), version 1.2, dated on September 28th, 2011.</li> <li>b. Validation Report for CDM project “CATALYTIC N2O DESTRUCTION PROJECT AT THE NEW NITRIC ACID PLANT PANNA 4 OF ENAEX S.A.” (Report No: 8000398029 – 11/370) issued by TÜV Nord, dated on 29/11/2011</li> <li>c. Revised PDD of the CDM Project “Catalytic N2O destruction project at the new nitric acid plant PANNA 4 of Enaex S.A.” (CDM Registration N° 5393), version 1.4, dated on September 17th, 2014</li> <li>d. Validation Opinion of post registration change at an existing CDM-project: Catalytic N2O destruction project at the new nitric acid plant PANNA 4 of Enaex S.A. (UNFCCC registration ref. No. 5393) report No. 00875HA issued by TÜV SÜV dated on 22/09/2014</li> <li>e. Previous Verification Report, specially the last one</li> <li>f. Previous Monitoring Reports</li> <li>g. Monitoring Report version 1 dated on 23/02/2015 (published version)</li> <li>h. Monitoring Report version 2 dated on 27/04/2015 (final version)</li> </ul>	Various See the left column.	PDD, Validation Report, Monitoring Reports, Verification Reports
2	UNFCCC IPCC	<b><u>References and requirements at UNFCCC</u></b> <ul style="list-style-type: none"> <li>a. UNFCCC homepage <a href="http://www.unfccc.int">http://www.unfccc.int</a> including the CDM section <a href="http://cdm.unfccc.int/index.html">http://cdm.unfccc.int/index.html</a>.</li> <li>b. Approved consolidated baseline and monitoring methodology ACM0019 - N2O abatement from nitric acid production, version 02.0.</li> </ul>	Various See the left column.	UNFCCC Regulative

Information Reference List	Verification of CDM Project	Page 3 of 9	 South Asia
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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date	Additional Information (Relevance in CDM context)
		<ul style="list-style-type: none"> <li>c. CDM Project Standard, version 07.0,</li> <li>d. Monitoring Report Form, version 04.0</li> <li>e. Tool to determine the mass flow of a greenhouse gas in a gaseous stream, version 02.0.0 Annex 11, EB61</li> <li>f. CDM Glossary</li> <li>g. CDM Validation and Verification Standard Version 07.0</li> </ul>		
4	COREMA, CONAMA, ENAEX S.A. Técnicas Reunidas S.A.	<p><b><u>Project Implementation, Licenses</u></b></p> <ul style="list-style-type: none"> <li>a. Test run Protocol for Panna4 Nitric Acid Plant signed by ENAEX and Tecnicas Reunidas Espindesa 05/11/2011</li> <li>b. Process Data Sheet of R4501 Ammonia Oxidation Reactor of Panna4 Nitric Acid Plant issued by Tecnicas Reunidas, 01 Process Data and 02 Materials rev. 01 dated on 22/09/2006</li> <li>c. Resolución Exenta N° 0121/2006 – permit for the whole complex dated on 29/05/2006 issued by CONAMA</li> <li>d. Data Sheet of AOR Thermocouple TT-45030 A,B,C</li> <li>e. Secondary Catalyst installation report issued by Heraus dated on 30/11/2011</li> <li>f. Screenshots of the control panel from FoxView (AOR temperature range)</li> <li>g. Commissioning Certificates for TAG's Meters: AT45094 A, AT45094 B, AT45094 C, FT45092, PT45091, PT45095, PT45097, TT45093, TT45096, dated on 13/12/2011</li> <li>h. Print screen of DeltaV screen dated 19/03/2015</li> <li>i. "Memorandum – Actual Capacity of Panna IV Nitric Acid Plant" issued by Técnicas</li> </ul>	Various See the left column.	


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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date	Additional Information (Relevance in CDM context)
		<p>Reunidas, S.A. and signed by the Fertilizer Division Manager dated on 01/03/2013</p> <p>j. Operating Manual – Project Panna 4 “Manual de operacion ProyectoPanna 4” issued by Técnicas Reunidas (UTE TR-ESPINDESA) dated on May 2008</p> <p>k. Secondary Catalyst System Inspection and Installation Report, performed by Heraeus on 23/07/2012</p>		
5	ENAEX S.A.	<p><b><u>Procedures and standards</u></b></p> <p>a. European Standard EN14181 Stationary source emissions - Quality assurance of automated measuring systems dated on July 2004</p> <p>b. “Responsibilities &amp; Operational Project Structure.pdf” version 1.0 issued by ENAEX dated on February 2012</p> <p>c. ISO 9001 Certificate for Planta Prillex America Mejillones Enaex S.A. valid until 29/10/2015</p> <p>d. Procedure DM-MR-CD-027 “Instrumentalist Work procedure”, version 1, 03/09/2007</p> <p>e. Procedure DM-MR-CD-080 “Thermocouple Temperature revision”, version 1, 03/08/2007</p> <p>f. Procedure “Analyzer N2O Concentration Calibration” (Not included in ISO)</p> <p>g. Procedure “Gauge pressure Transmitter Calibration” (Not included in ISO)</p>	Various See the left column.	QA/QC Procedures
6	Endress +Hauser WIKA INOR INECO	<p><b><u>Monitoring Equipment</u></b></p> <p>a. Email from Elliot Sanchez Product Manager Flow &amp; EMS Endress +Hauser Chile Ltda regarding recommendations of calibration frequency</p> <p>b. Manufacturer’s declaration, Document number 5006501 regarding Model TC10 issued by WIKA Alexander Wiegand SE &amp; Co. KG</p> <p>c. Statement from INOR – signed by a Service and Calibration Engineer - regarding stability of Meso-H / Meso HX applications</p>	Various See the left column.	Calibration Requirements Manufacturer


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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date	Additional Information (Relevance in CDM context)
		<ul style="list-style-type: none"> <li>d. Email from Anibal Gonzales from INECO S.A. regarding recommendations of calibration frequency of PT-45091, TT-45093 and PT-45095.</li> <li>e. Delta V Print Screen – Version number 11</li> <li>f. Statement from INECO dated on May 2012 regarding the hourly average calculation in the Delta-V system</li> <li>g. Statement from INECO dated on May 2012 regarding recommended calibration frequency of pressure model 2051C and temperature model 3144P transmitters</li> <li>h. Rosemount 2051 Reference Manual 00809-0100-4101, Rev AA dated on July 2008</li> <li>i. Rosemount 2051 Reference Manual 00809-0200-4101, Rev AA dated on July 2008</li> <li>j. Rosemount 3144P Reference Manual dated on August 2014</li> </ul>		
7	Various See the right column.	<p><b><u>Calibration</u></b></p> <ul style="list-style-type: none"> <li>a. FT 45026 and AT45026 Coriolis Flow and density calibration certificate issued by Endress+Hauser Flowtec dated on 09/11/2011 and density calibration certificate issued by BY H&amp;D Fitzgerald Ltd dated of issue 07/10/2013</li> <li>b. AT-45094 and FT-45092: QAL2 report issued by AIRTEC Date of test 23.10-25.10.2013. Measured objects: FT 45092 (tail gas volume), AT-45094 (N2O concentration), Moisture content, TT 45093 (Tail gas temperature), PT 45091 (Static pressure), PT-45095 (Atmospheric pressure)</li> <li>c. TT 45093: Serial number 706088 Temperature Transmitter Calibration Certificate issued by ENAEX S.A. dated on 22/08/2012 TT 45093: Serial number 706088 Temperature Transmitter Calibration Certificate issued by ENAEX S.A. dated on 19/02/2015</li> </ul>	Various See the left column.	Calibration evidences




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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date	Additional Information (Relevance in CDM context)
		<p>d. TT-45030 Thermometers:</p> <p>I. A: for serial number 1102RY6V: Calibration protocol TE –45030 A dated on 29/08/2012 for serial number 1104NO00: Calibration protocol TE –45030 A dated on 12/08/2014</p> <p>II. B: for serial number 1102RY6P: Calibration protocol TE –45030 B dated on 22/07/2012 for serial number 1104NC5E: Calibration protocol TE –45030 B dated on 12/08/2014</p> <p>III. C: for serial number 1102RY6Q: Calibration protocol TE –45030 C dated on 31/08/2012 for serial number 1104NC5D: Calibration protocol TE –45030 C dated on 12/08/2014</p> <p>e. TT-45050 - Certificate issued by ENAEX for HNO3 Temperature Transmitter (Manufacturer: Inor; Model: Meso-H) Serial Number N0809.842183/VO336261dated on 24/07/2012 TT-45050 - Certificate issued by ENAEX for HNO3 Temperature Transmitter (Manufacturer: Inor; Model: Meso-H) Serial Number N0809.842183/VO336261dated on 10/05/2014</p> <p>f. PT-45091 , Calibration Protocol for TAG PT-45091, issued by ENAEX S.A., dated on 13/01/2014 Calibration Protocol for TAG PT-45091, issued by ENAEX S.A., dated on 13/02/2014 Calibration Protocol for TAG PT-45091, issued by ENAEX S.A., dated on 12/03/2014 Calibration Protocol for TAG PT-45091, issued by ENAEX S.A., dated on 15/04/2014 Calibration Protocol for TAG PT-45091, issued by ENAEX S.A., dated on 10/06/2014 Calibration Protocol for TAG PT-45091, issued by ENAEX S.A., dated on 07/08/2014</p>		

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date	Additional Information (Relevance in CDM context)
		<p>Calibration Protocol for TAG PT-45091, issued by ENAEX S.A., dated on 10/09/2014</p> <p>Calibration Protocol for TAG PT-45091, issued by ENAEX S.A., dated on 11/10/2014</p> <p>Calibration Protocol for TAG PT-45091, issued by ENAEX S.A., dated on 12/11/2014</p> <p>Calibration Protocol for TAG PT-45091, issued by ENAEX S.A., dated on 16/12/2014</p> <p>g. PT-45095</p> <p>Calibration Protocol for TAG PT-45095, issued by ENAEX S.A., dated on 13/01/2014</p> <p>Calibration Protocol for TAG PT-45095, issued by ENAEX S.A., dated on 13/02/2014</p> <p>Calibration Protocol for TAG PT-45095, issued by ENAEX S.A., dated on 12/03/2014</p> <p>Calibration Protocol for TAG PT-45095, issued by ENAEX S.A., dated on 15/04/2014</p> <p>Calibration Protocol for TAG PT-45095, issued by ENAEX S.A., dated on 10/06/2014</p> <p>Calibration Protocol for TAG PT-45095, issued by ENAEX S.A., dated on 07/08/2014</p> <p>Calibration Protocol for TAG PT-45095, issued by ENAEX S.A., dated on 10/09/2014</p> <p>Calibration Protocol for TAG PT-45095, issued by ENAEX S.A., dated on 11/10/2014</p> <p>Calibration Protocol for TAG PT-45095, issued by ENAEX S.A., dated on 12/11/2014</p> <p>Calibration Protocol for TAG PT-45095, issued by ENAEX S.A., dated on 16/12/2014</p>		
8	ENAEX S.A. AIRTEC EMERSON	<p><b><u>Other Regular Maintenance other than Calibration</u></b></p> <p>a. Shewhart Control Chart, excel file with graphs of span and zero calibration values of N2O analyser for this monitoring period</p> <p>b. AT45094: QAL1 certificate MLT1 MLT2 of NGA Series issued by TÜV Rheinland Group dated on 16/02/1999</p> <p>c. AST Report (14-231_ENAEX AST report 2014_Panna 4_16-03-2015_Rev0), date of test 12 – 13/11/2014 issued by Airtec.</p>	Various See the left column.	

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date	Additional Information (Relevance in CDM context)
9	ENAEX S.A.	<b><u>Data Measured and Recorded</u></b> a. Delta V csv and mdi files (daily and monthly) for the monitoring period. b. HNO3 raw data hourly data for this monitoring period exported from DCS to Excel file		
10	ENAEX S.A.	<b><u>Calculation Spreadsheet and Tool</u></b> a. Spreadsheet of Calculation of Emission Reductions “MP 6_PANNA 4 (5393)_UNFCCC SUMMARY_v1_Confidential.xlsx” version 1 dated on 23/02/2015 b. Spreadsheet of Calculation of Emission Reductions “MP 6_PANNA 4 (5393)_UNFCCC SUMMARY_v2rev.xlsx” version 2 dated on 28/04/2015	Various See the left column	
11	ENAEX S.A.	<b><u>Special Events</u></b> a. Process History View - Charts for hours of analyzer switch - taken during onsite audit b. Email correspondence between ENAEX and AIRTEC explaining the delay in AST service (dated between August and November 2014) “AW_ AST in Panna 3_Panna4 (Evidence Airtec tests delay).pdf c. Quotation from Heraeus dated on 30/04/2014 “9103130098_ENAEX_Panna4_spare_parts_HRSC_NPM_AB_rev02.pdf” d. Drawing Panna4 Cataylasator Modification “Modification_July_2013_INDEX_01 - Blatt1.pdf” dated on 28/04/2015. e. Fox View Production Chart “Plan load (March-april 2014).pdf”.	Various See the left column.	
12	ENAEX S.A.	<b><u>Cross-Checking LogBooks Checklists</u></b> a. Weekly Checklist of Panna4 CDM Project instruments for this monitoring period. b. Production Data “Listado de Producciones Diarias Planta Prillex América”	Various See the left column.	

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document. Publication place	Issuance and/or submission date	Additional Information (Relevance in CDM context)
		<ul style="list-style-type: none"> <li>c. Raw data Check performed by ENAEX (Cross check MP6 Raw)</li> <li>d. Real Time measurements and charts, taken on-site.</li> </ul>		
13	Praxair	<p><b><u>Other External Data</u></b></p> <ul style="list-style-type: none"> <li>a. Analyzer test gas certificates (zero gas, span gas used in this monitoring period) issued by Praxair S.A.</li> </ul>	Various See the left column.	
14	ENAEX S.A. Carbon Climate Protection	<p><b><u>Trainings</u></b></p> <ul style="list-style-type: none"> <li>a. Signed List of Participants for Gas Analyzer Training (12/01/2012) held by Daniel Rojas Gas Analyser Specialist from INECO S.A.</li> <li>b. Signed List of Participants for Delta V Training (12-13/01/2012) held by Pablo Saez Delta V Specialist from INECO S.A.</li> <li>c. Information on internal WebEx Trainings held by Carbon Climate Protection</li> </ul>	Various See the left column.	Personnel trainings

## **Annex 3**

### **Appointment Certificates**



South Asia

# CERTIFICATE OF APPOINTMENT

Mr. Hammer, Martin fulfills the requirements of the Certification Body 'Environment and Energy' of TÜV SÜD South Asia Pvt Ltd to participate in audits.

Qualification applicable to					
Standard	CDM	GS	VCS	ISO-14064-1: 2006	Other
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Qualification as						
Status	Validator	Verifier	ATL	Technical Reviewer	Financial Expert	Technical Expert
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
TA (s)	1.2, 5.1, 5.2, 12.1					

Country Expertise						
Region	1	2	3	4	5	Other
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Further countries						

Technical Area
1.2_Renewables
5.1_Chemical industry
5.2_Caprolactam, nitric and adipic acid
12.1_Chemical industry

This appointment is valid until 31.01.2016 and is bound by internal requirements of the Certification Body 'Environment and Energy' of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0017/005.

Date	Signature
01/01/2015	

IS-CMS-CB-POG-01/05, version 03

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South Asia

## CERTIFICATE OF APPOINTMENT

Mr. Tausche, Konrad fulfills the requirements of the Certification Body 'Environment and Energy' of TÜV SÜD South Asia Pvt Ltd to participate in audits.

Qualification applicable to					
Standard	CDM	GS	VCS	ISO-14064-1: 2006	Other
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Qualification as						
Status	Validator	Verifier	ATL	Technical Reviewer	Financial Expert	Technical Expert
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
TA (s)	1.1, 5.1, 11.1, 12.1, 13.1					

Country Expertise						
Region	1	2	3	4	5	Other
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Further countries						

Technical Area
1.1_Thermal energy generation
5.1_12.1_Chemical industry
11.1_Emission of fluorinated gases
13.1_Solid waste and wastewater

This appointment is valid until 31.01.2016 and is bound by internal requirements of the Certification Body 'Environment and Energy' of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0042/005.

Date	Signature
01/01/2015	



South Asia

# CERTIFICATE OF APPOINTMENT

Mr. Castro, Javier fulfills the requirements of the Certification Body 'Environment and Energy' of TÜV SÜD South Asia Pvt Ltd to participate in audits.

Qualification applicable to					
Standard	CDM	GS	VCS	ISO-14064-1: 2006	Other
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Qualification as						
Status	Validator	Verifier	ATL	Technical Reviewer	Financial Expert	Technical Expert
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
TA (s)	1.2, 5.1, 11.1, 12.1, 13.1, 13.2					

Country Expertise						
Region	1	2	3	4	5	Other
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Further countries						

Technical Area
1.2_Renewables
5.1_12.1_Chemical industry
11.1_Emissions of fluorinated gases
13.1_Solid waste and wastewater
13.2_Manure

This appointment is valid until 31.01.2016 and is bound by internal requirements of the Certification Body 'Environment and Energy' of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0009/005.

Date	Signature
01/01/2015	

IS-CMS-CB-POG-01/05, version 03

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