JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
Version 01 - in effect as of: 15 June 2006

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

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Nitroporos Nitrous Oxide Abatement Project
Sectoral Scope: 5 (Chemical industry)
Version 2.2
29 August 2011

A.2. Description of the project:

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Nitrous oxide (N_2O) is an undesired by-product gas from the manufacture of nitric acid. Nitrous oxide is formed during the catalytic oxidation of ammonia. Over a suitable catalyst, a maximum 98% (typically 92-96%) of the ammonia fed is converted to nitric oxide (NO). The remainder participates in undesirable side reactions that lead to the production of nitrous oxide, among other compounds.

Waste N_2O from nitric acid production is typically released into the atmosphere, as it does not have any economic value or toxicity at typical emission levels. N_2O is an important greenhouse gas which has a high global warming potential (GWP) of 310.

The project activity involves the installation of a secondary catalyst to abate N_2O inside the reactor once it is formed.

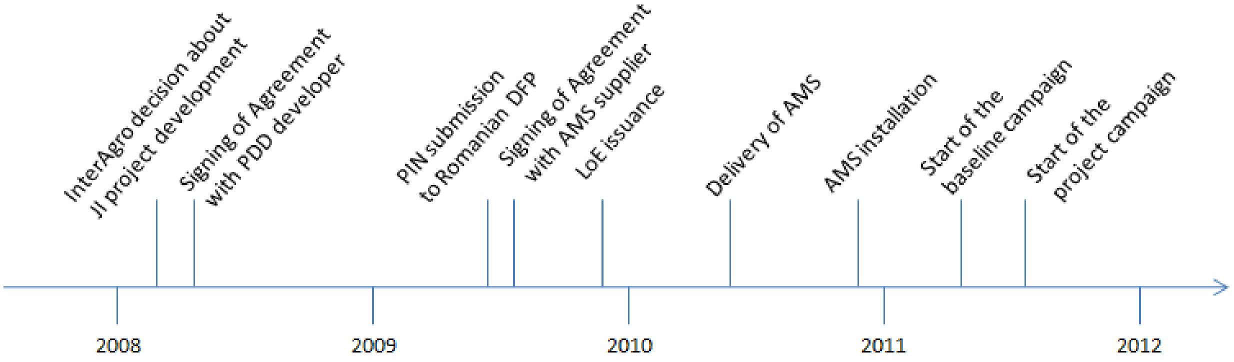
The baseline scenario is determined to be the release of N_2O emissions to the atmosphere at the currently measured rate, in the absence of regulations to restrict N_2O emissions. If regulations on N_2O emissions are introduced during the crediting period, the baseline scenario shall be adjusted accordingly.

The baseline emission rate will be determined by measuring the N_2O emission factor (kg N_2O/tonne HNO_3) during a production period before project implementation. To ensure that the data obtained during the initial N_2O measurement period for baseline emission factor determination are representative of the actual GHG emissions from the source plant, a set of process parameters known to affect N_2O generation and under the control of the plant operator will be controlled from historical data.

Baseline emissions will be dynamically adjusted from activity levels on an ex-post basis through monitoring the amount of nitric acid production. Project N_2O emissions will be monitored directly in real time. Additional N_2O monitoring and recording facilities will be installed to measure the amount of N_2O emitted by the project activity.

Project additionality is determined using the most recent version of the “tool for demonstration and assessment of additionality”, approved by the CDM Executive Board.

The main milestones of the project are described in Table 1:



Date	Description
April 18, 2008	Decision to proceed with JI project development and sign of the contract with PDD developer
April 21, 2008	Contract signature with PDD developer MGM International
January 18, 2009	Decision on secondary catalyst supplier
June 1, 2009	Contract signature with Nitroporos, allocating duties of the Parties in terms of Project development
June, 2009	PIN submission to Romanian DFP
June 17 .2009	Contract signature with AMS supplier (ABB)
September 29, 2009	Issuance of LoE (#8333)
April 28, 2010	Delivery of AMS (delay in delivery due to technical and financial issues)
November 24, 2010	AMS start-up
July, 2011	Start of baseline period
September,2011	Start of first project period

Table 1. Timeline of the project.

The project activity will contribute to the sustainable development of the country through industrial technology transfer (catalyst technology from a developed country to Romania). The project activity will reduce N_2O emissions and will neither increase nor decrease direct emissions of other air pollutants.

The project does not impact the local communities or access of services in the area. The project activity will not cause job losses at Nitroporos' plant.

Nitroporos Nitrous Oxide Abatement Project has the potential to be replicated by other nitric acid plants in the country.

A.3. Project participants:

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Party involved	**Legal entity project participant (as applicable)**	**Please indicate if the Party involved wishes to be considered as project participant (Yes/No)**
Romania (host)	S.C. Nitroporos S.R.L. Private entity	No
Sweden	MGM Carbon Portfolio , S.a.r.l. Ptivate entity	No

The history of Nitroporos goes back to 1924, with the creation of “The Fist Romanian Company for Explosives”. In 1935 it was decided that a new company, “Nitramonia”, should be created to manufacture the nitric acid and ammonium nitrate required for the production of explosives, and in 1936 “Nitramonia Company” began operations. In 1948 both companies (i.e., “The First Romanian Company of Explosives” and “Nitramonia Company”) merged into a single entity, “I.I.S. Nitramonia Fagaras”, which was nationalized. In 1960 the company changed both name and functions and became “Chemical Factory Fagaras” throughout the entire communist period, manufacturing a wide variety of products. In 1990 “Chemical Factory Fagaras” was split into two companies:

- S.C. Nitramonia S.A: production of: chemical fertilizers, inorganic salts, phenol-formaldehyde resins, organic intermediates and industrial explosives.
- S.C. Rompiro Fagaras: production of strategic products for the defense industry.

As from this date S.C. Nitramonia S.A changed ownership several times:

1990-11.2002 state property,
11.2002-04.2003 Fletcher Group (Turkey),
04.2003-04.2004 S&T Oil Equipment & Machinery (USA)
04.2004 - S&T Oil Equipment & Machinery (USA) as Nitrofertilizer SA
02.2005-12.2007 state property.

The company became part of the InterAgro Group of Companies after acquisition by SC InterAgro S.A. (namely, by VIROMET SA Victoria, 90% of which is owned by InterAgro S.A.) in December 2007.

S.C. Nitroporos S.R.L. was established in March 2008 on the basis of S.C. Nitramonia S.A., following voluntary liquidation of S.C. Nitramonia S.A.’s legal successors..

The main activity of Nitroporos is the manufacture of fertilizers and nitrogen compounds, inorganic chemicals, explosives and plastics.

The holding company of the group is S.C. InterAgro S.A., a privately owned Romanian-British joint venture founded in 1994 and involved primarily in grain production and foreign trade, especially the export of fertilizers for agriculture

The Nitroporos nitric acid production plant is single line dual pressure plant (medium pressure in AOR - 2,5-3,2 bars, high pressure in Absorption tower – 7,0-8,0 bars). The line consists of 4 AORs, 1 compressor, 1 absorption tower and 1 stack. Plant was built in 1980 with capacity of 750 t HNO_3/day and in 1987-1988 after modernization the capacity reached 840 t HNO_3/day. (More technical details are in section. D.1.). However, following the end of the communist period operations were halted, and the plant remained at a standstill for more than five years (from February 2005). Operations were only resumed in October 2009, after the establishment of S.C. Nitroporos S.R.L.

A.4. Technical description of the project:

A.4.1. Location of the project:

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A.4.1.1. Host Party(ies):

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Romania is located in South-Eastern Europe and is a member of the European Union.

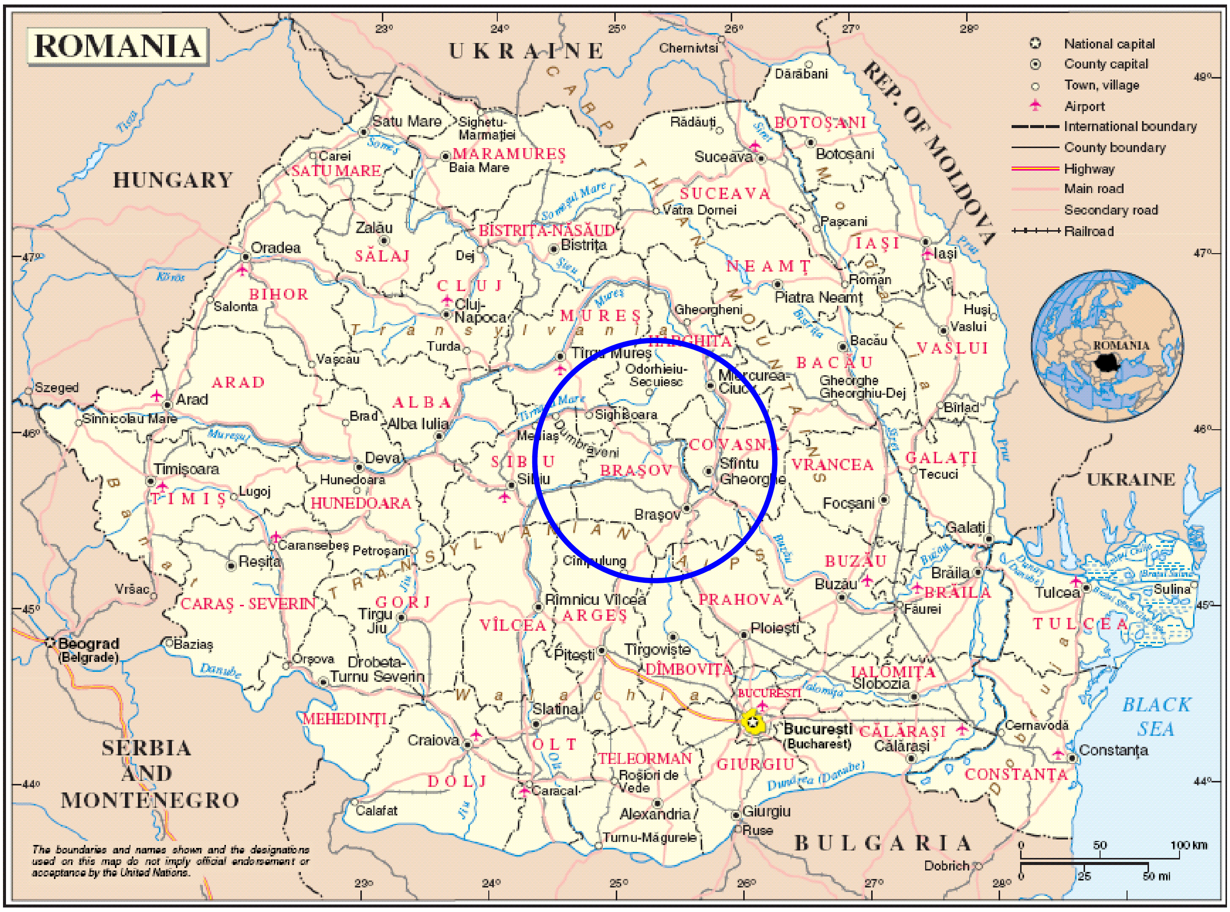

Figure 1: Map of Romania showing project location

A.4.1.2. Region/State/Province etc.:

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Brasov

A.4.1.3. City/Town/Community etc.:

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Fagaras

A.4.1.4. Details of physical location, including information allowing the unique identification of the project (maximum one page):

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The project is located in the city of Fagaras, Brasov County, in central Romania. It lies on the Olt River and has a population of 35,400 as of 2004.

The GPS coordinates of the plant are:

45°48'32.58" North
24°58'49.03" East

Figure 2: Nitroporos plant location

A.4.2. Technology(ies) to be employed, or measures, operations or actions to be implemented by the project:

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The Ostwald process

Nowadays, all commercial nitric acid is produced by the oxidation of ammonia, and subsequent reaction of the oxidation products with water, through the Ostwald process.

The basic Ostwald process involves 3 chemical steps:

A) Catalytic oxidation of ammonia with atmospheric oxygen, to yield nitrogen monoxide (or nitric oxide)

(1) $4\ NH_3 + 5\ O_2 \rightarrow 4\ NO + 6\ H_2O$

B) Oxidation of nitrogen monoxide to nitrogen dioxide or dinitrogen tetroxide

(2) $2\ NO + O_2 \rightarrow 2\ NO_2 \rightarrow N_2O_4$

C) Absorption of the nitrogen oxides in water to yield nitric acid

(3) $3\ NO_2 + H_2O \rightarrow 2\ HNO_3 + NO$

Reaction 1 is favored by lower pressure and higher temperature. Nevertheless, at excessively high temperatures, secondary reactions take place that lower yield (affecting nitric acid production). Thus, an optimal reaction temperature is found between 850 and 950°C, affected by other process conditions and catalyst chemical composition (Figure 3)[1]. Reactions 2 and 3 are favored by higher pressure and lower temperatures.

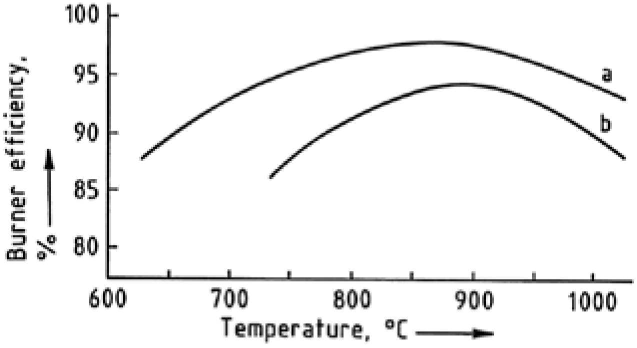

Figure 3: Conversion of ammonia to nitrogen monoxide on platinum gauze as a function of temperature at (a) 100 kPa; (b) 400 kPa

The way in which these three steps are implemented characterizes the various nitric acid processes found throughout the industry. In mono-pressure or single pressure processes ammonia combustion and nitrogen oxide absorption take place at the same working pressure. In dual pressure or split pressure plants the absorption pressure is higher than the combustion pressure.

Nitrous oxide formation

Nitrous oxide is formed during the catalytic oxidation of ammonia. Over a suitable catalyst, a maximum 98% (typically 92-96%) of the ammonia fed is converted to nitric oxide (NO) according to Reaction 1 above. The remainder participates in undesirable side reactions that lead to nitrous oxide (N_2O), among other compounds.

Side reactions during oxidation of ammonia:

(4) $4\ NH_3 + 4\ O_2 \rightarrow 2\ N_2O + 6\ H_2O$ (nitrous oxide formation)

(5) $4\ NH_3 + 3\ O_2 \rightarrow 2\ N_2 + 6\ H_2O$

(6) $2\ NO \rightarrow N_2 + O_2$

(7) $4\ NH_3 + 6\ NO \rightarrow 5\ N_2 + 6\ H_2O$

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[1] Thieman et al., "Nitric Acid, Nitrous Acid, and Nitrogen Oxides", *Ullmann's Encyclopedia of Industrial Chemistry 6th Edition*, Wiley-VCH Verlag GmbH & Co. KGaA. All rights reserved.

N_2O abatement technology classification

The potential technologies (proven and under development) to treat N_2O emissions at nitric acid plants have been classified as follows, on the basis of the process location of the control device:

Primary: N_2O is prevented from forming in the oxidation gauzes.
Secondary: once formed, N_2O is eliminated anywhere between the outlet of the ammonia oxidation gauzes and the inlet of the absorption tower.
Tertiary: N_2O is removed at the tail gas, after the absorption tower and before the expansion turbine.
Quaternary: N_2O is removed following the expansion turbine and before the stack.

Selected technology for the project activity

General description

The current project activity involves the installation of a new (not previously installed) catalyst below the oxidation gauzes (a “secondary catalyst”) whose sole purpose is the decomposition of N_2O. The secondary approach has the following advantages:

- The catalyst does not consume electricity, steam, fuels or reducing agents (all sources of leakage) to eliminate N_2O emissions; thus, operating costs are negligible and the overall energy balance of the plant is not affected.
- Installation is relatively simple and does not require any new process unit or re-design of existing ones (the reactor basket needs some modifications to accommodate the new catalyst).
- Installation can be done simultaneously with a primary gauze changeover; thus, the loss in production due to incremental downtime will be limited.
- Considerably lower capital costs (summarized in Annex 4) as compared to other approaches.

Nitroporos has decided that, given successful baseline monitoring implementation and registration as a JI project, it shall install a secondary catalyst system, and has selected BASF as technology provider. BASF has developed a solution for a “secondary” catalyst, whose sole purpose is to decompose N_2O without affecting nitric acid production. Typically, the catalyst has a very high activity for N_2O decomposition (the minimum expected removal efficiency is 83%). Beyond high abatement of N_2O, some other advantages of the use of secondary catalyst are: proven performance, no measurable effect on ammonia to nitric oxide yield, and its implementation does not lead to increased NO_x emissions.

There are several secondary catalyst suppliers who offer essentially the same technical approach (high temperature N_2O heterogeneous decomposition). At the moment of purchase, Nitroporos will re-evaluate performance and cost advantages of the BASF system vis-à-vis others available at that moment in the market, and may eventually switch to another secondary catalyst supplier, in order to assure the best available technology is utilized for the project. Nevertheless, this decision will not in any way affect the project activity as described in this PDD.

The secondary abatement technology has been tested in several industrial trials in which it has proven to be reliable in reducing N_2O and environmentally safe. Especially, its implementation does not lead to increased NO_x emissions. Nor is the environment directly or indirectly harmed in any other way.
Nitroporos and BASF will ensure that the N_2O abatement catalyst is returned to the supplier at the end of its useful life and refine, recycle or dispose of it according to the prevailing EU standards.

Once installed, the catalyst itself and the automated measuring system (AMS) will be operated by the local Nitroporos employees. All project participants will work together in training Nitroporos workers to reliably supervise the effective operation of the catalyst technology, apply the installed monitoring system to measure the emission levels and collect the data in a manner that allows the successful completion of each verification procedure.

A.4.3. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project, including why the emission reductions would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

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The project activity consists in the installation of a secondary catalyst inside the ammonia burner, and beneath the primary catalyst, whose sole purpose is to reduce the N_2O emissions.

Due to high temperature and the presence of the secondary catalyst, the N_2O previously formed is converted into N_2 and O_2.

N_2O is typically released into the atmosphere as common practice in the industry, since it does not have any economic value or toxicity at typical emission levels.

Currently, there are no national regulations or legal obligations in Romania concerning N_2O emissions. It is unlikely that any such limits on N_2O emissions will be imposed in the near future.

From what was said earlier, it is concluded that N_2O would not be removed in the absence of the proposed project activity.

A.4.3.1. Estimated amount of emission reductions over the crediting period:

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Based on the above, the estimated amount of emission reductions over the first crediting period is the following:

	Years
Length of the crediting period	1 year 6 months
Year	Annual estimated emission reduction in tonnes of CO_2e
Year 2011	60,456
Year 2012	198,642
Total estimated reductions (tonnes of CO_2e)	259,098
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	172,732

Subject to approval by the host country, the crediting period may be extended beyond the first crediting period of the Kyoto Protocol. Estimated amount of emission reductions for the 8-year period after 2012 is the following:

	Years
Length of the crediting period	8 years
Year	Annual estimated emission reduction in tonnes of CO2e
Year 2013	266,007
Year 2014	290,190
Year 2015	302,281
Year 2016	376,556
Year 2017	376,556
Year 2018	376,556
Year 2019	376,556
Year 2020	376,556
Total estimated reductions (tonnes of CO_2e)	2,741,257
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	342,657

These estimated amounts are calculated on the basis of the Nitroporos plant road map figures: 2011 - 70,000 t/year, 2012 – 115,000 t/year, 2013 – 154,000 t/year, 2014 – 168,000 t/year, 2015 – 175,000 t/year, 2016-2020 – 218,000 t/year and the IPCC upper limit default emission factor for N2O emissions from medium pressure nitric acid plants, i.e., 7 ± 20% kg N2O/$tHNO_3$ ("V3_3_Ch3_Chemical_Industry - IPCC", page 3.23, table 3.3).. In order to be conservative, project emission factor is taken as 8.4 kg N2O/$tHNO_3$ (7 kg N2O/$tHNO_3$ + 20%) and for baseline calculation as 7 kg N2O/$tHNO_3$. This particular approach has been validated by DFP of Romania. More details can be found in section D.1.4.

A.5. Project approval by the Parties involved:

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LoE Ref.no. Reg. No.: 8333 / N.N./ Sep 29, 2009 of the host country DFP was issued. This section will be completed after receiving the LoA.

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

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Following JI criteria for baseline setting and monitoring methodologies adopted during the fourth meeting of the Joint Implementation Supervisory Committee (JISC) that took place in Bonn, Germany, on September 13-15, 2006, an approved methodology for CDM project activities can be applicable for JI project activities.

The elements of AM0034 version 05.1.0 the baseline and monitoring methodology are chosen to develop the project activity. Thus, the baseline scenario will be chosen following the procedures stated in AM0034.

The proposed project activity meets the applicability conditions required by the methodology:

- Nitroporos' plant limits the application of this project activity to existing nitric acid production;
- The project activity will not result in the shutdown of any existing N_2O destruction or abatement facility or equipment in the plant;
- The project activity will not affect the level of nitric acid production;
- There are currently no regulatory requirements or incentives to reduce levels of N_2O emissions from nitric acid plants in Romania;
- The project activity will not increase NO_x emissions;
- Nitroporos' plant has no non-selective catalytic reduction (NSCR) $DeNO_x$ abatement system installed;
- Operation of the secondary N_2O abatement catalyst installed under the project activity does not lead to any process emissions of greenhouse gases, directly or indirectly;
- Continuous real-time measurements of N_2O concentration and total gas volume flow will be carried out in the stack:
  - Before the installation of the secondary catalyst and;
  - After the installation of the secondary catalyst throughout the chosen crediting period of the project activity.

Explanation and Justification for deviations from AM0034

The following aspects of the approved CDM baseline & monitoring methodology AM0034, version 05.1.0 "Catalytic reduction of N2O inside the ammonia burner of nitric acid plants" are either not applied or applied in a modified manner:

Project Implementation Aspect	AM0034	Adjustment in JI project specific context
Baseline campaign	Baseline emissions established over one complete Baseline campaign.	Baseline campaign approach is not applicable for the purposes of this JI project. Because establishing a baseline emission factor through continuous monitoring of both N_2O concentration and gas flow volume in the stack of the nitric acid plant for one complete period before project implementation (as suggested by approved CDM methodology AM0034) is not acceptable for this project, considering that the baseline measurement may take up to the end of the year 2012 and no emission reductions would be produced within the

		first commitment period of the Kyoto Protocol. The long lifetime of the catalytic gauzes and low production of the plant suggest that the end of the current production period may be beyond the end of 2012. Instead of this approach, a system of emission factor benchmarks proposed by IPCC is applied. To ensure the conservativeness and to confirm the applicability of a benchmark, actual N_2O emissions will be measured and actual emissions factor will be calculated during the production of at least 5,000 tonnes of 100% nitric acid before the installation of the secondary catalyst.
Baseline Emissions	Baseline Emissions are based on the actual N_2O emissions.	A system of benchmarks is described in paragraph D.1.1.4 of PDD.
Permitted range of operational parameters	Permitted range are established to prevent “baseline gaming” (i.e. manipulation of baseline emissions) by plant operators to increase their emission reduction potential.	Permitted ranges of operational parameters are established for the period of measuring the actual N_2O emissions before secondary catalyst installation. The permitted ranges of operational parameters will be defined on the base of AM0034 using historical data for the period going from plant start-up in October 2009 after long term downtime until the date of the start of the period for the measuring of actual plant N_2O emissions. For oxidation pressure the plant design diagram and internal production manuals are applied
Calculation of project emission reductions	Total emission reductions of the project for a specific campaign are calculated by subtracting of the project emissions factor from the baseline emissions factor and multiplying the result by the number of tonnes of nitric acid produced during the particular campaign.	Project emission reductions are calculated based on verification periods and not on standard production campaigns since this definition is no applied for this project. They are calculated by subtracting of the project emissions factor of the project period from the baseline emissions factor, that is defined on the base of approach that is described in paragraph D.1.1.4 and multiplying the result by the number of tonnes of nitric acid produced during the particular period.
Cap on baseline campaign length	Maximum allowable nitric acid production is capped for the baseline campaign.	Since the baseline measurement is done over the fixed period that is not linked to gauze replacement schedule, this rule is not applicable for this JI project
Cap on HNO_3 production for which ERUs can be earned	The maximum value of NAP eligible for ERU issuance shall not exceed the design capacity. “By nameplate (design) implies the total yearly capacity	Since the annual capacity is not specified in the design documents, it is established based on the daily design capacity of the plant, which is multiplied by the number of operating days per year. The plant design documents show that after the

	(considering 365 days of operation per year) as per the documentation of the plant technology provider".	modernization in the year 1982 daily design capacity is 750 metric tonnes of HNO_3, and Note drawn by plant design developer IITPIC Bucharest confirms that plant has the same capacity with 3 and 4 reactors. To ensure the conservativeness of the approach it is assumed that the plant operates 330 days per year (instead of 365 days as suggested in the methodology). This gives the annual capacity of 247,500t.
Recalculation of EF_{BL}-value in case of shorter Project campaign.	In case a project campaign is shorter than the baseline campaign, EF_{BL} is re-calculated for that campaign.	Since the monitoring periods are not linked to gauze replacement schedule, this rule is not applicable for this JI project.
Monitoring Periods based on campaigns	Verifications can only be performed for full campaigns.	This restriction is not applied. Emission reductions can be determined for any suitable period of time, which is defined as a monitoring period.
Moving Average Emissions Factor	Project emissions are compared to the average emission factor of all previous project campaigns (of the first 10 campaigns only). The higher value applies for calculating emission reductions.	This step is applied for this project but since the definition of campaign is not used in this project the Moving Average Emissions Factor is defined for all previous monitoring periods (of the first 10 periods only). The higher value applies for calculating emission reductions.
Minimum project emissions factor after 10th campaign-	No project emissions factor after the 10th project campaign may be lower than the lowest recorded during these campaigns.	This step is applied for this project but since the definition of campaign is not used in this project the Minimum project emissions factor is established after the 10th monitoring period based on the emission factors in all previous periods.

The baseline methodology application first involves an identification of possible baseline scenarios, and eliminating those that would not qualify. The procedures followed for baseline scenario selection correspond to AM0028 "Catalytic N_2O destruction in the tail gas of Nitric Acid and Caprolactam Production Plants" version 05.1.0 (EB 28) as it is specified in the selected AM0034 version 05.1.0; for more details see the following link at the UNFCCC website:

http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

The analysis of baseline scenarios involves five steps:

Step 1. Identify technically feasible baseline scenario alternatives to the project activity.

The first step in determining the baseline scenario is to analyze all options available to project participants. These include the business-as-usual case, considering sectoral policies and circumstances to determine whether this case corresponds to the continuation or not of the current operation of the nitric acid industry, the project scenario, and any other scenarios that might be applicable. This *first step* can be further broken down into two sub-steps:

Sub-step 1a: The baseline scenario alternatives should include all possible options that are technically feasible to handle N_2O emissions. These options include:

- Continuation of *status quo.* The continuation of the current situation, where there will be no installation of technology for the destruction or abatement of N_2O;
- Switch to an alternative production method not involving the ammonia oxidation process;
- Alternative use of N_2O, such as:
  - Recycling N_2O as a feedstock;
  - Use of N_2O for external purposes;
- Installation of a Non-Selective Catalytic Reduction (NSCR) DeNOx unit;
- The installation of an N_2O destruction or abatement technology:
  - Tertiary measure for N_2O destruction
  - Primary or secondary measures for N_2O destruction or abatement.

The options include the JI project activity not implemented as a JI project.

Sub-step 1b:

In addition to the baseline scenario alternatives of Sub-step 1a, all possible options that are technically feasible to handle NO_x emissions should be considered. The installation of a NSCR DeNOx unit could also cause N_2O emission reduction. Therefore NO_X emission regulations are taking into account in determining the baseline scenario. The respective options are, inter alia

- The continuation of the current situation, whether a $DeNO_x$ unit is installed or not;
- Installation of a new selective catalytic reduction (SCR) $DeNO_x$ unit;
- Installation of a new non-selective catalytic reduction (NSCR) $DeNO_x$ unit;

Installation of a new tertiary measure that combines NO_x and N_2O emission reduction

Step 2: Eliminate baseline alternatives that do not comply with legal or regulatory requirements.

Currently, there are no national regulations or legal obligations in Romania concerning N_2O emissions. It is unlikely that any such limits on N_2O emissions will be imposed in the near future. In fact, given the cost and complexity of suitable N_2O destruction and abatement technologies, it is unlikely that a limit would be introduced in Romania considering it has ratified the Kyoto Protocol and actively participates in JI. In accordance with Integrated Environmental Permit #SB 108 from 05.02.2010 plant has a voluntary plan to implement JI Project to reduce N2O emissions using the best available technology until the end of Permit validity (05.02.2020). The Integrated Environmental Permit does not define any limits for N_2O emissions

In 1993 the Environmental Protection Ministry of Romania published an ordinance (No. 462, din 1.07) that set a cap on total emissions of nitrogen oxide (NO_x), although said regulation was never enforced. As from 2005, and as a consequence of Romania' negotiations to become a member of the European Union, Nitroporos should comply with EU regulations on NO_x emissions. Nitroporos plans to take corrective actions (the installation of a SCR $DeNO_x$ system). This action plan is included in the above mentioned Integrated Environmental Permit.. In accordance with this document Nitroporos should reduce NOx emissions from 513 mg/m3 to 308 mg/m3 during year 2011.

Since Nitroporos' plant should install the SCR $DeNO_x$ reduction catalyst to be in compliance with applicable local NO_x regulations, the installation of a $DeNO_x$ unit is a valid baseline alternative.

- None of the baseline alternatives can be eliminated in this step, with the exception of "continuation of the status quo", which is not in compliance with legal and regulatory requirements.

Step 3: Eliminate baseline alternatives that face prohibitive barriers (barrier analysis).

Sub-Step 3a: On the basis of the alternatives that are technically feasible and in compliance with all legal and regulatory requirements, a complete list of barriers that would prevent the deployment of alternatives in the absence of JI is established.

The identified barriers are:

- Investment barriers, inter alia:
  - Debt funding is not available for this type of innovative project activity;
  - Limited access to international capital markets due to real or perceived risks associated with domestic or foreign direct investment in the country where the project activity is to be implemented;

- Technological barriers, inter alia:
  - Technical and operational risks of alternatives;
  - Technical efficiency of alternatives (e.g., N_2O destruction, abatement rate);

Sub-Step 3b: We will show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed JI project activity):

- Primary abatement technology: Currently, there is no technology from the primary approach group that reaches removal efficiency high enough to represent a potential N_2O abatement solution in itself.
- Tertiary abatement technology: Available tertiary approaches include the NSCR (non-selective catalytic reduction) and the EnviNOx® process commercialized by Uhde GmbH (Germany); both systems are not selective towards N_2O abatement, and also act on over acidic species (NO_x). Although Uhde’ process is more efficient than the traditional NSCR system, both technologies have significant requirements regarding space that is highly limited in Nitroporos.
- Switch to an alternative production method not involving the ammonia oxidation process: This is not an option because there is no other commercially viable alternative to produce nitric acid.
- The use of N_2O for external purposes: This is technically not feasible at the Nitroporos plant, as the quantity of gas to be treated is extremely high, compared to the amount of nitrous oxide that could be recovered. The use of N_2O for external purposes is not carried out either in Romania or anywhere else.
- Recycling N_2O as a feedstock: We may discard recycling N_2O as a feedstock for the nitric acid plant. This is because nitrous oxide is not a feedstock for nitric acid production. Nitrous oxide is not recycled at nitric acid plants either in Romania or anywhere else.

Therefore the baseline alternatives that are not eliminated in this step are:

- Installation of a selective catalytic reduction (SCR) $DeNO_X$ unit;
- Installation of a secondary catalytic DeN_2O plus a (SCR) $DeNO_X$ unit.

Step 4: Identify the most economically attractive baseline scenario alternative.

To conduct the investment analysis, the following sub-steps are used:

Sub-step 4a: Determine appropriate analysis method:

Since the project alternatives generate no financial or economic benefits other than JI-related income, simple cost analysis should be applied.

Sub-step 4b: Apply simple cost analysis:

The possible alternatives listed in Sub-step 1a above, and not discarded at the barrier analysis stage, involve the installation of some form of secondary DeN_2O system plus a (SCR) $DeNO_x$ unit, or a selective catalytic reduction (SCR) $DeNO_x$ unit.

The installation of a secondary DeN_2O system involves substantial investment costs (summarized in Annex 4), and would need to provide benefits (other than JI revenue) in order to qualify as valid baselines. No income from any kind of potential product or by-product except Emission Reduction Units (ERUs) is able to pay back investment costs and running costs for the installation of any such abatement systems as no marketable products or by-products are generated by these treatment methods.

Thus, there is no incentive to install a secondary catalyst for the abatement of N_2O and the most attractive alternative is the installation of a selective catalytic reduction (SCR) unit, which leads to the following advantages:

- NO_x decomposition in accordance with EU standards;
- No consumption of natural gas for heating the tail gas in the process of NO_x decomposition;
- Low operational costs.

According to the baseline methodology,

> *"If all alternatives do not generate any financial or economic benefits, then the least costly alternative among these alternatives is pre-selected as the most plausible baseline scenario."*

Therefore, the only feasible baseline is the installation of a selective catalytic reduction unit, which will meet NO_x regulations, and requires lower investment and operational costs. The period of installation of the SCR $DeNO_x$ unit is inessential, since modern SCR technologies have no influence on GHG emissions.

Sub-step 4c is not applied, since a simple cost analysis is adequate for this project.

Sub-step 4d: Sensitivity analysis:

Since the economic analysis is based on simple cost analysis, the baseline methodology does not require a sensitivity analysis: the results are not sensitive to such factors as inflation rate and investment costs, since there are no economic benefits.

Step 5: Re-assessment of baseline scenario in the course of proposed project activity lifetime.

At the start of a crediting period, a re-assessment of the baseline scenario due to new or modified NO_x or N_2O emission regulations in Romania will be executed as follows.

Sub-step 5a: New or modified NO_x emission regulations:

If new or modified NO_x emission regulations are introduced after the project starts, the baseline scenario will be re-assessed at the start of a crediting period. Baseline scenario alternatives to be analyzed will include, inter alia:

- Selective catalytic reduction (SCR);
- Non-selective catalytic reduction (NSCR);
- Tertiary measures incorporating a selective catalyst for destroying N_2O and NO_x emissions;

- Continuation of baseline scenario.

For the determination of the adjusted baseline scenario, the baseline determination process will be applied as stipulated above (Steps 1-5).

Sub-step 5b: New or modified N_2O regulations:

If legal regulations on N_2O emissions are introduced or changed during the crediting period, the baseline emissions will be adjusted at the time the legislation is legally implemented.
The methodology is applicable if the procedure to identify the baseline scenario results in that the most likely baseline scenario is the continuation of N_2O emission to the atmosphere, without the installation of N_2O destruction or abatement technologies, including technologies that indirectly reduce N_2O emissions (e.g., NSCR $DeNO_x$ units).

Key information and data used to establish the baseline:

a) Data and parameters not monitored and demanded to confirm applicability conditions:

See paragraph D 1.1.3

B.2. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:

>>
Nitroporos Nitrous Oxide Abatement Project involves the installation of secondary catalysts, the only purpose and effect of which is the decomposition of nitrous oxide once it is formed.

Following the selected methodology, project emissions are determined from N_2O measurements in the stack gas of the nitric acid plant.

Baseline emissions are calculated from system of emission factor benchmarks that is defined on the base of measurements during baseline period in accordance with paragraph D 1.1.4 before the implementation of the project activity (the installation of a secondary catalyst).

To ensure that data obtained during said initial period are representative of the actual GHG emissions from the source plant, a set of process parameters known to affect N_2O generation and which are (to some extent) under the control of the plant operator are monitored and compared to limits or ranges called “normal operating conditions”.

Normal operating conditions are defined on the basis of plant historical operating conditions and plant design data. A range or maximum value for any given parameter has been established considering specific control capabilities of Nitroporos’ nitric acid plant. In order to properly characterize baseline emission rates, operation during such initial period is controlled within the specified limit (a maximum or range has been established for each parameter). Only those N_2O measurements taken when the plant is operating within the permitted range will be considered in the calculation of baseline emissions. The level of uncertainty determined for the N_2O monitoring equipment will be deducted from the baseline emission factor.

The emission factor determined during the baseline period will be presented for crediting of emission reductions.

The additionality of the project activity is demonstrated and assessed using the latest version of the “Tool for demonstration and assessment of additionality” ver 5.2 (EB39). We will demonstrate that the baseline scenario is installation of a selective catalytic reduction (SCR) $DeNO_x$ unit.

Step 1 of the tool can be avoided since the selection of alternative scenarios was already covered in the analysis carried out in Section B.1 above.

Step 2. Investment analysis.

Sub-step 2a. Determine appropriate analysis method:

As catalytic N_2O destruction facilities generate no financial or economical benefits other than JI-related income, a simple cost analysis is applied.

Sub-step 2b. Apply simple cost analysis:

Project scenario: No income from any kind of potential product or by-product except ERUs is able to pay back investment costs as well as running costs for the installation of the secondary catalyst as no marketable product or by-product exists.

The investment (excluding potential financing costs) consists of the engineering, construction, shipping, installation and commissioning of the secondary catalyst and the monitoring equipment. The running costs consist of the regular change of the catalysts, personnel costs for the supervision and cost of the measurement equipment.

Baseline scenario: The baseline scenario "Installation of a selective catalytic reduction (SCR) $DeNO_x$ unit" will require lower investment and running costs than the implementation of the project activity.

Therefore, the proposed JI project activity is, without the revenues from the sale of ERUs, obviously less economically and financially attractive than the baseline scenario.

Step 3. Barrier analysis is not used for demonstrating additionality in this project.

Step 4. Common practice analysis.

Sub-step 4a: Analyze other activities similar to the proposed project activity:

The proposed project activity (or any other form of nitrous oxide abatement technology) is not common practice since no similar project at nitric acid plants is identified in Romania. (3 projects together with Nitroporos project are currently in the process of development by InterAgro Group). Similar projects are implemented in other Romanian Nitric Acid plants: DonauChem (InterAgro Group), Asomures and Doljchim, all of which are developed under the aegis of Kyoto Protocol and received LoEs from the Romanian DFP).
The nitric acid industry typically releases into the atmosphere the N_2O generated as a by-product, as it does not have any economic value or toxicity at typical emission levels. N_2O emissions through the stack gas can be considered the business-as-usual activity as it is a widespread practice around the country. No nitric acid plant in Romania has a secondary catalyst (or any other type of N_2O abatement technology) currently installed without concurrent JI project implementation.

Sub-step 4b: Discuss any similar options that are occurring:

No similar projects are operating in Romania without concurrent JI project implementation.

Since similar project activities are not observed the proposed project activity is additional.

Conclusion:

Currently, there are no national regulations or legal obligations in Romania concerning N_2O emissions. It is unlikely that any such limits on N_2O emissions will be imposed in the near future. In fact, given the cost and complexity of suitable N_2O destruction and abatement technologies, it is unlikely that a limit would be introduced by Romania, which has ratified the Kyoto Protocol and actively participates in JI.

Nitroporos has no need to invest in any N_2O destruction or abatement technology. Nor are there any national incentives or sectoral policies to promote similar project activities.

Without the sale of the ERUs generated by the project activity no revenue would be generated and the technology would not be installed. The secondary catalyst technology when installed will reduce nitrous oxide emissions by an 83% (guaranteed average) of what they would otherwise be without the catalyst technology installed.

The proposed JI project activity is undoubtedly additional, since it passes all the steps of the “tool for demonstration and assessment of additionality (Version 05.2)”, approved by the CDM Executive Board.

The approval and registration of the project activity as a JI activity, and the attendant benefits and incentives derived from the project activity, will offset the substantial cost of the secondary catalyst and any plant modifications and will enable the project activity to be undertaken.

On the basis of the *ex-ante* estimation of N_2O emission reductions, it is expected that the income from selling of ERUs of the determined JI project activity is at least as high as the investment, financing and running costs. Therefore Nitroporos is willing to finance the project activity under the condition of its determination as a JI project activity.

B.3. Description of how the definition of the project boundary is applied to the project:

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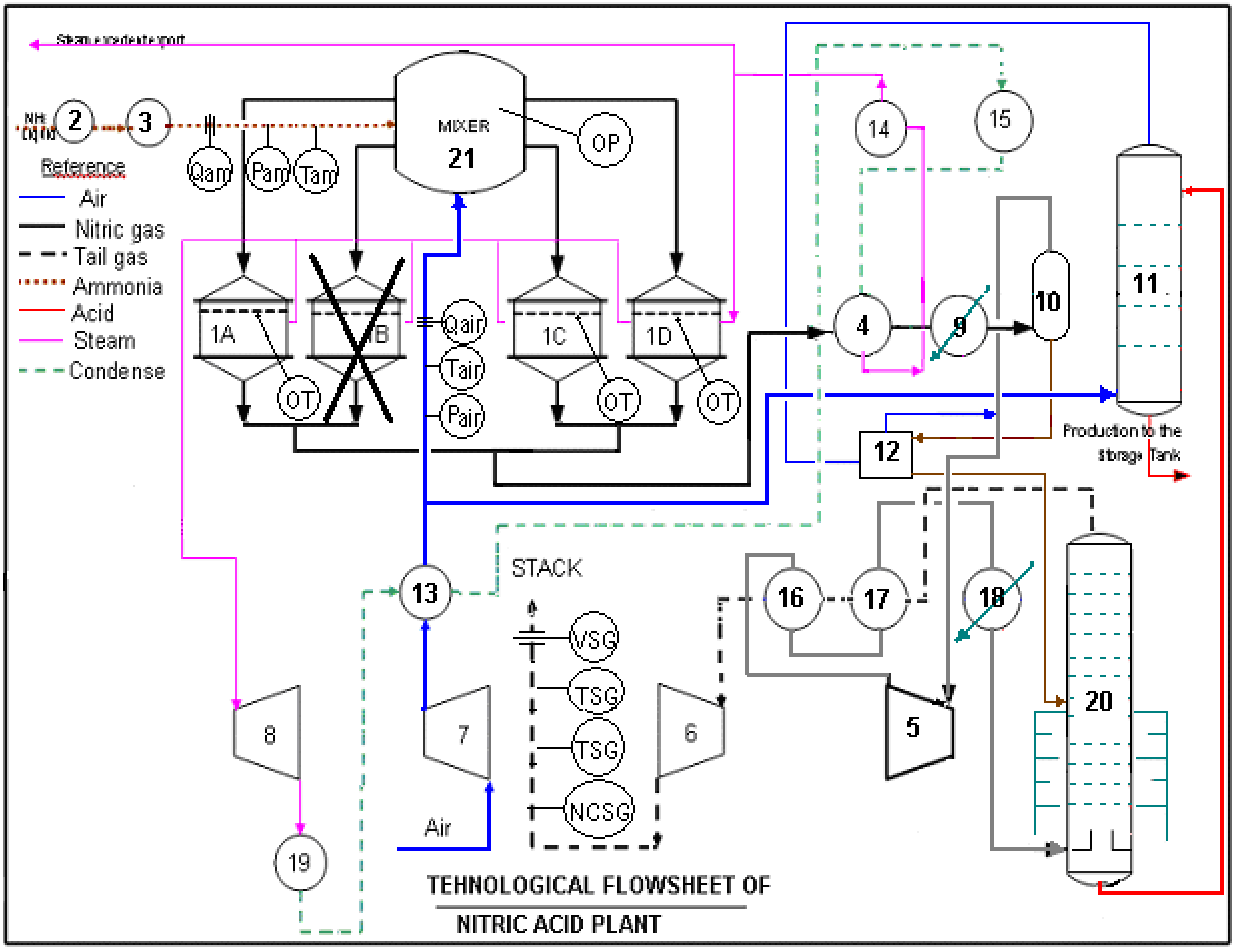
The project boundary encompasses the physical, geographical site of the Nitroporos nitric acid plant and equipment for the complete nitric acid production process from the inlet to the ammonia burner to the stack. The only GHG emission relevant to the project activity is N_2O contained in the waste stream exiting the stack. The abatement of N_2O is the only GHG emission under the control of the project participant.

The secondary catalyst utilizes the heat liberated by the highly exothermal oxidation reaction (which occurs on the precious metal gauzes of the primary catalyst) to reach its effective operating temperature. Once the operating temperature is reached, no incremental energy is necessary to sustain the reaction.

	Source	**Gas**	**Included?**	**Justification/Explanation**
Baseline	Nitric Acid Plant (Burner Inlet to Stack)	CO_2	Excluded	The project does not lead to any change in CO_2 or CH_4 emissions, and, therefore, these are not included.
		CH_4	Excluded	
		N_2O	Included	
Project Activity	Nitric Acid Plant (Burner Inlet to Stack)	CO_2	Excluded	The project does not lead to any change in CO_2 or CH_4 emissions.
		CH_4	Excluded	
		N_2O	Included	
	Leakage emissions from production, transport, operation and decommissioning of the catalyst	CO_2	Excluded	No leakage emissions are expected.
		CH_4	Excluded	
		N_2O	Excluded	



1. A,C,D. Ammonia Oxidation Reactors (B reactor is unmounted)
2. Ammonia evaporator,
3. Ammonia superheater
4. Economizer
5. Compressor NOx
6. Recuperative turbine
7. Air compressor
8. Steam turbine
9. Water condenser
10. Condensor
11. Acid degasification column
12. Buffer vessel, acid condensate
13. Air cooler
14. Steam saturator
15. Water degasifier
16. Cooler of NOx gases
17. Cooler of NOx gases
18. Final cooler of NOx
19. Steam turbine condensor
20. Absorption column
21. Air-ammonia mixer

Figure 4: Project boundary

The design of the nitric acid production facility developed by IITPIC (Institute for the Chemical Industry, Bucharest) provides the possibility of using 3 or 4 ammonia oxidation reactors (AORs) The plant currently operates with 3 AORs and reactor 1B has been dismounted.

B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

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Date of baseline setting: 25/11/2010 (AMS start-up date)
The baseline and monitoring methodology has been applied by:
Sergii Klibus, Nuria Zanzottera, and María Inés Hidalgo, MGM International Group LLC (not project participant).
Tel: +380-50-221-66-55
e-mail: sklibus@mgminter.com; nzanzottera@mgminter.com; ihidalgo@mgminter.com.

SECTION C. Duration of the project/crediting period

C.1. Starting date of the project:

\>>
21/04/2008. Date of the signature of the contract with the project developer.

C.2. Expected operational lifetime of the project:

\>>
10 years.

C.3. Length of the crediting period:

\>>
The crediting period of the project shall be 9 years 6 months, of which 1 year and 6 months will be within the first commitment period of the Kyoto Protocol. The status of the emission reductions after the end of the first commitment period of the Kyoto Protocol will be determined by any relevant agreement under the UNFCCC and is subject to the approval by the host Party.

Starting date of the crediting period:is July 2011, when the secondary catalyst is planned to be installed and the project is expected to start generating emission reductions.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

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The Nitroporos site is a large fertilizer complex. Many of the plants' activities and services are performed by common/shared staff, so personnel have qualifications and experience beyond any specific plant or operation.

The Nitroporos nitric production plant is dual pressure plant with middle operating pressure inside AOR (2,5-3,2 bars) and high operating pressure in absorption tower (7,0-8,0 bars). The nitric acid production facility consists of one line. The design developed by IITPIC (Institute for the Chemical Industry, Bucharest) provides the possibility of using 3 or 4 ammonia oxidation reactors (AORs) The plant currently operates with 3 AORs. The line includes 1 compressor, 1 absorption tower and 1 stack. The nitric acid plant is operated by a centralized automated control system ; thus, operators are qualified and experienced in operating technical equipment to a high level of quality standards. The plant has access to specialized technical services from the central MEA (mechanical, electrical and automation) department.

The plant manager will be responsible for the ongoing operation and maintenance of the N_2O monitoring system. Operation, maintenance, calibration and service intervals will be according to the manufacturer' specifications and international standards (see QA/QC section below).

The proposed JI project will be closely monitored, metered and recorded in accordance with monitoring plan. The management and operation of the proposed nitrous oxide abatement project will be the responsibility of Nitroporos plant. The emission reductions will be verified by an independent entity, which will be an Accredited Independent Entity (AIE) and the national technical authority (NEPA), through its subordinated units (county agencies for environmental protection-EPAs). The reports will be submitted to the Romanian DFP (Ministry of Environment and Sustainable Development) and processed in accordance with National JI Track I Procedure.

D.1.1. Option 1 – Monitoring of the emissions in the project scenario and the baseline scenario:

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:

Data/Parameter:	**NCSG (N_2O Concentration in the Stack Gas)**
Data unit:	mgN_2O/m^3 at normal conditions (101.325 kPa, 0 deg C).(converted from ppm if necessary)
Description:	N_2O concentration in the stack gas during the project period

Time of determination/monitoring	Over project periods and will be verified during the verification visit. The values are scanned on 1 second basis and used for calculation of one hour averages.
Source of data to be used:	N_2O analyzer.
Value of data applied (for ex ante calculations/determination)	Will be calculated for each project period. The values are scanned on 1 second basis and used for calculation of one hour averages.
Justification of the choice of data or description of measurement methods and procedures actually applied:	N_2O concentration is measured by ABB online analyzers URAS 2000 type that include URAS 26 on-line analyzer module (non dispersive infrared principle) on dry basis. A gas stream is continuously drawn from the stack by the sampling system under proper conditions, and driven to the infrared cell. The values are scanned on 1 second basis and used for calculation of one minute averages.
QA/QC procedures to be applied:	Regular calibrations according to vendor specifications and recognized industry standards (EN 14181). Staff will be trained in monitoring procedures.
Any comment:	This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**VSG (Volume Flow of the Stack Gas)**
Data unit:	m^3/h
Description:	Volume flow rate of the stack gas during a project period. AMS automatically normalizes values that are received from sensors and represents normalized value in report. It should be stated for normal conditions (101.325 kPa, 0 deg C)
Time of determination/monitoring	Over project periods and will be verified during the verification visit. The values are scanned on 1 second basis and used for calculation of one minute averages.
Source of data to be used:	Gas volume flow meter.
Value of data applied (for ex ante calculations/determination)	Will be calculated for each project period.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Differential Pressure flow sensor SDF-22 with pressure transmitter Model 265DS. The values are scanned on 1 second basis and used for calculation of one minute averages. The values are measured under wet conditions. At the same time, preliminary measurements show that moisture content in the stack is negligibly small. If this statement is confirmed by QAL2 results, the conditions will be considered as dry. Otherwise values will be recalculated by methodology recommended in QAL2 report.
QA/QC procedures to be applied:	Regular calibrations according to vendor specifications and recognized industry standards (EN 14181). Staff will be trained in monitoring procedures.
Any comment:	This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the

	project.

Data/Parameter:	**TSG (Temperature of the Stack Gas)**
Data unit:	ºC
Description:	Temperature of the stack gas during a project period
Time of determination/monitoring	Over project periods and will be verified during the verification visit.
Source of data to be used:	Temperature probe. The values are scanned continuously and used for calculation of one minute averages.
Value of data applied (for ex ante calculations/determination)	Not applicable. We do not use this parameter to estimate expected emission reductions. We use these data only for $VSG_{project}$ normalization.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Pressure transmitter with thermoresistance PT100 range 0-150°C
QA/QC procedures to be applied:	Regular calibrations according to vendor specifications and recognized industry standards (EN 14181). Staff will be trained in monitoring procedures.
Any comment:	This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**PSG (Pressure of the Stack Gas)**
Data unit:	Pa
Description:	Pressure of the stack gas during the baseline and project periods
Time of determination/monitoring	Over project periods and will be verified during the verification visit.
Source of data to be used:	Probe (part of gas volume flow meter The values are scanned on 2 seconds basis and used for calculation of one minute averages.
Value of data applied (for ex ante calculations/determination)	Not applicable. We do not use this parameter to estimate expected emission reductions. We use these data only for VSG normalization.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Type DMU01ST pressure transmitter, range 0-0,16 bar

QA/QC procedures to be applied:	Regular calibrations according to vendor specifications and recognized industry standards (EN 14181). Staff will be trained in monitoring procedures.
Any comment:	This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**OH (Operating Hours)**
Data unit:	Hours
Description:	Operating hours during the project period
Time of determination/monitoring	Over project periods and will be verified during the verification visit.
Source of data to be used:	Plant automated control system and production log. Monitored daily.
Value of data applied (for ex ante calculations/determination)	Will be calculated for each project period.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Plant operating status is determined on the basis of the speed indicator of the steam turbine. If the trip value is equal or higher than 4450 revolutions per minute the plant status is ON, otherwise plant status is OFF. Since plant does not keep the records of steam turbine RPM values, the oxidation temperature is used during emission factor and emission reductions calculations for crosscheck of plant status. If hourly oxidation temperature value is lower than 750°C, plant status is treated like OFF for such monitored hour.
QA/QC procedures to be applied:	Critical instruments are calibrated on a routine basis according to the plant’s maintenance program.
Any comment:	Compiled for each entire period. This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**NAP (Nitric Acid Production)**
Data unit:	$tHNO_3$
Description:	Nitric acid production (100% concentrated) during each project period or vintage year
Time of determination/monitoring	Monitored daily over project periods and will be verified during the verification visit. Completed for each entire period.
Source of data to be used:	Production log
Value of data applied (for ex ante calculations/determination)	1) Production on the base of production road map: 2011 -70,000 t/year, 2012 – 115,000 t/year, 2013 – 154,000 t/year, 2014 – 168,000 t/year, 2015 – 175,000 t/year, 2016-2020 – 218,000 t/year . 2) Plant design capacity. Plant design documents show that after the modernization in the year 1982 daily maximum design

	capacity is 750 metric tonnes of HNO3. To ensure the conservativeness of the approach it is assumed that the plant operates 330 days per year (instead of 365 days as suggested in the methodology). This gives an annual capacity of 247,500t.
Justification of the choice of data or description of measurement methods and procedures actually applied:	The determination of diluted nitric acid production by shift is made by means of a float-type level sensor, installed on each nitric acid tank. At the same time, production HNO_3 concentration is determined on an hourly basis in the laboratory. Production acid temperature is continuously measured and recorded by the control panel instruments. Acid density is determined from the Grand Paroise tables, depending on concentration and temperature. The foreman calculates the quantity of acid, expressed in 100%, produced during that shift and records it in the Daily Production report**.** In order to control these figures, the Crosschecking calculation of the nitric acid production amount is performed at the end of each month. Information that specifies month-end stock, incoming quantities, outgoing quantities and month-end stock is accumulated by the Technical–Production Department. On the basis of this information, the calculated consumption of ammonia for obtaining nitric acid, the calculated consumption of ammonia for obtaining the ammonium nitrate in all the four grades (porous, fertilizer, technical and solution), as well as the calculated consumption of nitric acid for obtaining the ammonium nitrate in all four grades are determined. The calculated value is compared to the value measured by the flow meters. If production deviation, calculated by means of both methods, is below 5%, then it is considered that the nitric acid production measured by float and level gauge system is confirmed. Otherwise, an additional internal inquiry should be performed.
QA/QC procedures to be applied:	Critical instruments are calibrated on a routine basis according to the plant' maintenance program.
Any comment:	Compiled for each entire period. Total production over project period. This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**$GS_{project}$ (Project Gauze Supplier)**
Data unit:	Name of gauze supplier
Description:	Normal gauze supplier for the project periods
Time of determination/monitoring	To be obtained during the operating condition period and will be verified during the verification visit
Source of data to be used:	Nitric acid plant procurement office on the basis of delivery documents
Value of data applied (for ex	Umicore, Heraeus. We do not use this parameter to estimate expected emission reductions. We use it to verify the gauze supplier,

ante calculations/determination)	to evaluate whether it meets methodology requirements.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Cover of supply contract or bill for gauzes for project period, or equivalent document to prove commercial transaction
QA/QC procedures to be applied:	None
Any comment:	To be obtained during project period. This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**$GC_{project}$ (Project Gauze Composition)**
Data unit:	% precious metals
Description:	Normal gauze composition for the operation condition periods
Time of determination/monitoring	During project periods and will be verified during the verification visit
Source of data to be used:	Nitric acid plant procurement office on the basis of delivery documents
Value of data applied (for ex ante calculations/determination)	Pt 95%, Rh 5%. We do not use this parameter to estimate expected emission reductions. We use it to verify the gauze supplier, to evaluate whether it meets methodology requirements
Justification of the choice of data or description of measurement methods and procedures actually applied:	Section of supply contract for gauzes that specifies the technical characteristics agreed during the baseline period
QA/QC procedures to be applied:	None
Any comment:	To be obtained during the operating condition period. This information will be available in electronic records and on paper for at least 2 years after the end of the project activity.

Data/Parameter:	**PE_n (N_2O Emission of nth Project period)**
Data unit:	t N_2O
Description:	N_2O emission for a project period

Time of determination/monitoring	Calculated at least once after each period
Source of data to be used:	Calculated from monitored data
Value of data applied (for ex ante calculations/determination)	96,504 t N_2O Estimated amount which is calculated using the estimated value of N_2O baseline emissions, considering an N_2O abatement efficiency of 83% and using an estimated value of operating hours during the project period.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Calculated from monitored data
QA/QC procedures to be applied:	No QA/QC procedure is needed.
Any comment:	N_2O project emission will be calculated on the basis of measurements of stack gas flow rate, N_2O concentration, and the operating hours. All parameters will be measured during a project period to properly characterize N_2O project emissions.

Data/Parameter:	**EF_n (Project Emission Factor)**
Data unit:	t N_2O/t 100% HNO_3
Description:	Project emission factor calculated from monitored data for each project period
Time of determination/monitoring	Calculated at least once after each project period
Source of data to be used:	Calculated from monitoring data
Value of data applied (for ex ante calculations/determination)	0.001428 tN2O/t 100% HNO3 Estimated amount which is calculated using the estimated value of N_2O baseline emission, considering an N_2O abatement efficiency of 83% and using an estimated value of operating hours during the project period and estimated value of nitric acid production.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Calculated from monitored data on the basis of methodology

QA/QC procedures to be applied:	No QA/QC procedure is needed.
Any comment:	Project emission factor will be calculated on the basis of measurements of the nitric acid production, stack gas flow rate and N_2O concentration.

Data/Parameter:	**EF_{reg} (Emission Factor set by Regulation)**
Data unit:	Not applicable
Description:	Emission level set by incoming policies or regulations
Time of determination/monitoring	During the whole project duration
Source of data to be used:	Monitored
Value of data applied (for ex ante calculations/determination)	Not applicable. We do not use this parameter to estimate expected emission reductions.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Nitroporos has personnel that verify changes in the relevant Romanian legislation.
QA/QC procedures to be applied:	None
Any comment:	Updated when new regulation comes into force

Data/Parameter:	**$EF_{ma,n}$ (Moving Average Emission factor)**
Data unit:	tonne N_2O / tonne 100% HNO_3
Description:	Moving average of emission factor calculated as the average of the emission factors of all previous project periods
Time of determination/monitoring	Calculated at the end of each project period
Source of data to be used:	Calculated from monitoring period emissions factors
Value of data applied (for ex ante calculations/determination)	0.001428 t N_2O/t 100% HNO_3. Estimated amount which is calculated using the estimated value of N_2O baseline emission, considering an N_2O abatement efficiency of 83% and using an estimated value of operating hours during the project period.
Justification of the choice of data or description of	Calculated as the average of the emission factors of each project period.

measurement methods and procedures actually applied:	
QA/QC procedures to be applied:	None
Any comment:	None

Data/Parameter:	**EF_p (Emission factor used to determine emission reductions)**
Data unit:	tonne N_2O / tonne 100% HNO_3
Description:	Emission factor used to calculate the emission from the particular period.
Time of determination/monitoring	Calculated at the end of each project period
Source of data to be used:	Calculated using monitoring period emission factors.
Value of data applied (for ex ante calculations/determination)	0.001428 t N_2O/t 100% HNO_3. Estimated amount which is calculated using the estimated value of N_2O baseline emission, considering an N_2O abatement efficiency of 83% and using an estimated value of operating hours during the project period.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Calculated using monitoring period emission factors. EF_p will be determined as the higher of $EF_{ma,n}$ and EF_n.

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

>>

Actual project emissions will be determined during the project activity from continuous measurements of N_2O concentration and total flow rate in the stack gas of the nitric acid plant.

Project measurements are subjected to exactly the same procedure as the baseline measurements in order to be coherent.

Estimation of period-specific project emissions

The monitoring system will provide separate readings for N_2O concentration and gas flow for a given period of time (e.g., every hour of operation, i.e., an average of the measured values of the past 60 minutes). Error readings (e.g., downtime or malfunction) and extreme values are eliminated from the output data series. Next, the same statistical evaluation that was applied to the baseline data series has to be applied to the project data series:

a) Calculate the sample mean (x);
b) Calculate the sample standard deviation (s);
c) Calculate the 95% confidence interval (equal to 1.96 times the standard deviation);
d) Eliminate all data that lie outside the 95% confidence interval;
e) Calculate the new sample mean from the remaining values.

The mean values of N_2O concentration and total flow rate are used in the following formula (Eq. 3 from AM0034) to calculate project emissions:

$$PE_n = VSG_n \cdot NCSG_n \cdot 10^{-9} \cdot OH_n$$

Where

PE_n	Total project emissions of the nth period, in tN_2O
VSG_n	Mean stack gas volume flow rate for the nth project period , in Nm^3/h
$NCSG_n$	Mean concentration of N_2O in the stack gas for the project period , in mgN_2O/Nm^3
OH_n	Number of operating hours in the project period, in h

Derivation of a moving average emission factor

In order to take into account possible long-term emission trends over the duration of the project activity and to take a conservative approach a moving average emission factor is estimated as follows:

Step 1. Estimate the period-specific emission factor for each period during the project’ crediting period by dividing the total mass of N_2O emissions during that period by the total production of 100% concentrated nitric acid during that same period.

For example, for the *nth* period the period-specific emission factor would be:

$$EF_n = \frac{PE_n}{NAP_n}$$

Where

EF_n	Emission factor calculated for the *nth* period, in kg N_2O/t HNO_3
PE_n	Total project emissions of the *nth* period, in tN_2O
NAP_n	Nitric acid production in the *nth* period, in t 100% HNO_3

Step 2: Estimate a moving average emission factor calculated at the end of the *nth* project as follows:

$$EF_{ma,n} = \frac{\sum_n EF_n}{n}$$

This process will be repeated for each period such that a moving average, $EF_{ma,n}$, is established over time, becoming more representative and precise with each additional period.

To calculate the total emission reductions achieved in the *nth* period, the higher of the two values $EF_{ma,n}$ and EF_n shall be applied as the emission factor relevant for that particular period (EF_p).

If $EF_{ma,n} > EF_n$, then $EF_p = EF_{ma,n}$
If $EF_{ma,n} < EF_n$, then $EF_p = EF_n$

Minimum project emission factor

A period-specific emission factor will be used to cap any potential long-term trend towards decreasing N_2O emissions that may result from a potential build-up of platinum deposits. After the first ten periods of the crediting period of the project, the lowest EF_n observed during those periods will be adopted as a minimum (EF_{min}). If any of the later project periods results in an EF_n that is lower than EF_{min}, the calculation of the emission reductions for that particular period will use EF_{min} instead of EF_n.

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:

Data/Parameter:	**OT_{normal} (Normal Operating Temperature)**
Data unit:	ºC
Description:	Normal range of oxidation temperature of the ammonia reactor
Time of determination/monitoring	Operating temperature was monitored during operating condition period and will be verified during the verification visit.
Source of data (to be) used:	Historical data were used. Calculated on the basis of operating temperature during operating condition period using OT values of 3 reactors separately and during the baseline period, control of OT parameters will be performed for each of 3 reactors separately.
Value applied (for ex ante calculations/determinations):	Will be defined before the baseline period.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Nitroporos has adequate historical registers for operating parameters from plant start-up (October 2009) until the date of AMS installation (30000 MT of nitric acid 100%) and later until the date of baseline period startup. These data will be used to determine normal oxidation temperature. Reactor temperature is measured in each reactor by NiCr-Ni thermocouple and Temperature transmitter T12.30
QA/QC procedures (to be) applied	Not necessary
Any comment:	This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**OP_{normal} (Normal Operating Pressure)**
Data unit:	Pa
Description:	Normal range of oxidation pressure of the ammonia reactor
Time of determination/monitoring	The parameter was monitored during operating condition period and will be verified during the verification visit.

Source of data (to be) used:	Values from plant design diagram and internal production manual are applied.
Value applied (for ex ante calculations/determinations):	Will be defined before the baseline period.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Pressure at the oxidation reactors is not a process control parameter, therefore values from plant design diagram and internal production manual are applied. Pressure is measured by an in-line Honeywell smart pressure transmitter model ST3000 with 0-4 bar measuring range.
QA/QC procedures (to be) applied	Not necessary
Any comment:	This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**AFR_{max} (Maximum Ammonia Flow Rate)**
Data unit:	kg NH_3/hour
Description:	Maximum value of ammonia flow rate to the ammonia oxidation reactor
Time of determination/monitoring	The parameter was monitored during operating condition period and will be verified during the verification visit.
Source of data used:	Historical data were used.
Value applied (for ex ante calculations/determinations):	10,904 kg NH_3/hour
Justification of the choice of data or description of measurement methods and procedures actually applied:	Nitroporos has adequate historical registers for operating parameters from plant start-up (October 2009) for production of 30,000 tonnes of nitric acid (100%) until the date of AMS installation and it is used to determine normal ammonia flow rate. The flow is measured by-smart pressure transmitter model ST3000 with 0-4 bar measuring range.
QA/QC procedures (to be) applied	Not necessary
Any comment:	This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**$AIFR_{max}$ (Maximum Ammonia to Air Flow Ratio)**
Data unit:	kg NH_3/kg air

Description:	Maximum ammonia to air ratio
Time of determination/monitoring	Monitored during operating condition period and will be verified during the verification visit
Source of data used:	Historical data were used. Calculated on the basis of ammonia and air flow to oxidation reactor.
Value applied (for ex ante calculations/determinations):	0.0796 kg NH_3/kg air
Justification of the choice of data or description of measurement methods and procedures actually applied:	Nitroporos has adequate historical registers for operating parameters from plant start-up (October 2009) for production of 30,000 tonnes of nitric acid (100%) until the date of AMS installation and it is used to determine ammonia to air ratio. Air flow to the oxidation reactor is measured by-smart pressure transmitter model ST3000 with 0-4 bar measuring range. The ammonia to air ratio is calculated on the basis of the actual flow analysis from the individual streams (ammonia and air).
QA/QC procedures (to be) applied	Not necessary
Any comment:	This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**GS_{normal} (Normal Gauze Supplier)**
Data unit:	
Description:	Gauze supplier during normal operating condition period
Time of determination/monitoring	The parameter was monitored during historical periods and will be verified during the verification visit.
Source of data used:	Historical data of nitric plant procurement office were used.
Value applied (for ex ante calculations/determinations):	Umicore, Heraeus
Justification of the choice of data or description of measurement methods and procedures actually applied:	Nitroporos has adequate historical registers for operating parameters from plant start-up (October 2009) for production of 30,000 tonnes of nitric acid (100%) until the date of AMS installation and it is used to determine normal gauze supplier.
QA/QC procedures (to be) applied	Not necessary

Any comment:	This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**GC_{normal} (Normal Gauze Composition)**
Data unit:	%
Description:	Gauze composition during normal operation conditions
Time of determination/monitoring	The parameter was monitored during historical periods and will be verified during the verification visit.
Source of data used:	Historical process data from nitric acid plant procurement office were used.
Value applied (for ex ante calculations/determinations):	Pt 95% Rh5%
Justification of the choice of data or description of measurement methods and procedures actually applied:	Nitroporos has adequate historical registers for operating parameters from plant start-up (October 2009) for production of 30,000 tonnes of nitric acid (100%) until the date of AMS installation and it is used to determine normal gauze composition.
QA/QC procedures (to be) applied	Not necessary
Any comment:	This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

a) Data and parameters monitored

Data/Parameter:	**$NCSG_{BP}$ (Baseline N_2O Concentration in the Stack Gas)**
Data unit:	mgN_2O/m^3 under normal conditions (101.325 kPa, 0 deg C).(converted from ppm if necessary)
Description:	Mean concentration of N_2O in the stack gas during the baseline period
Time of determination/monitoring	Over the period of the baseline period and will be verified during the verification visit.
Source of data to be used:	N_2O analyzer.
Value of data applied (for ex ante calculations/determination)	Will be defined during the baseline period

Justification of the choice of data or description of measurement methods and procedures actually applied:	N_2O concentration is measured by ABB online analyzers URAS 2000 type which include URAS 26 on-line analyzer module (non dispersive infrared principle) on dry basis. A gas stream is continuously drawn from the stack by the sampling system under proper conditions, and driven to the infrared cell.
QA/QC procedures to be applied:	Regular calibrations are performed according to vendor specifications and recognized industry standards (EN 14181). Staff will be trained to perform and control these procedures.
Any comment:	The data output from the analyzer will be processed using an appropriate software program. This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**VSG_{BP} (Baseline Volume Flow of the Stack Gas)**
Data unit:	m^3/h
Description:	Mean gas volume flow rate at the stack in the baseline measurement period. . Should be stated for normal conditions (101.325 kPa, 0 deg C). AMS automatically normalizes values that are received from sensors and represents normalized value in report.
Time of determination/monitoring	Over the period of the baseline period and will be verified during the verification visit.
Source of data to be used:	Flow meter. The values are scanned continuously and used for calculation of one minute averages.
Value of data applied (for ex ante calculations/determination)	Will be defined during the baseline period
Justification of the choice of data or description of measurement methods and procedures actually applied:	Differential Pressure flow sensor SDF-22 with pressure transmitter Model 265DS. The values are scanned on 1 second basis and used for calculation of one minute averages. The values are measured under wet conditions. At the same time, preliminary measurements show that moisture content in the stack is negligibly small. If this statement is confirmed by QAL2 results, the conditions will be considered as dry. Otherwise values will be recalculated by methodology recommended in QAL2 report.
QA/QC procedures to be applied:	Regular calibrations according to vendor specifications and recognized industry standards (EN 14181). Staff will be trained in monitoring procedures.
Any comment:	The data output from the analyzer will be processed using an appropriate software program. This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**TSG (Temperature of the Stack Gas)**
Data unit:	ºC
Description:	Temperature of the stack gas

Time of determination/monitoring	Over the period of the baseline and project periods to be verified during the verification visit.
Source of data to be used:	Temperature probe. The values are scanned continuously and used for calculation of one minute averages.
Value of data applied (for ex ante calculations/determination)	Not applicable. We do not use this parameter to estimate expected emission reductions. We use these data only for **VSG_{BP}** and **VSG** normalization.
Justification of the choice of data or description of measurement methods and procedures (to be) applied:	Pressure transmitter with thermoresistance PT100 range 0-150°C
QA/QC procedures to be applied:	Regular calibrations according to vendor specifications and recognized industry standards (EN 14181). Staff will be trained in monitoring procedures.
Any comment:	This information will be available in electronic records and on paper for at least 2 years after the end of the project activity. The values are scanned each second and used for calculation of one minute averages.

Data/Parameter:	**PSG (Pressure of the Stack Gas)**
Data unit:	Pa
Description:	Pressure of stack gas
Time of determination/monitoring	Over the period of the baseline and project period and will be verified during the verification visit.
Source of data to be used:	Pressure probe. The values are scanned continuously and used for calculation of one minute averages.
Value of data applied (for ex ante calculations/determination)	Not applicable. We do not use this parameter to estimate expected emission reductions. We use these data only for VSG_{BP} and VSG normalization.
Justification of the choice of data or description of measurement methods and procedures (to be) applied:	Type DMU01ST pressure transmitter, range 0-0.16 bar
QA/QC procedures to be applied:	Regular calibrations according to vendor specifications and recognized industry standards (EN 14181). Staff will be trained in monitoring procedures.
Any comment:	This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the

	project. The values are scanned each 2 seconds and used for calculation of one minute averages.

Data/Parameter:	**OH_{BP} (Baseline Operating Hours)**
Data unit:	Hours
Description:	Total operating hours during the baseline period
Time of determination/monitoring	Over the baseline period and will be verified during the verification visit.
Source of data to be used:	Plant automated control system and production log. Recorded daily, compiled for the entire period.
Value of data applied (for ex ante calculations/determination)	Will be defined during baseline period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied:	Plant operating status is determined on the basis of present thresholds for oxidation temperature.
QA/QC procedures to be applied:	Critical instruments are calibrated on a routine basis according to the plant’ maintenance program.
Any comment:	This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**NAP_{BP} (Nitric Acid Production)**
Data unit:	$tHNO_3$
Description:	Total nitric acid production during baseline period (100% concentrated)
Time of determination/monitoring	Over the baseline period and will be verified during the verification visit.
Source of data to be used:	Production log. Calculated on the basis of recorded daily values, compiled for the entire period.
Value of data applied (for ex ante calculations/determination)	min. 5,000 tonnes

Justification of the choice of data or description of measurement methods and procedures (to be) applied:	The determination of diluted nitric acid production by shift is made by means of a float-type level sensor, installed on each nitric acid tank. At the same time, production HNO_3 concentration is determined on an hourly basis in the laboratory. Production acid temperature is continuously measured and recorded by the control panel instruments. Acid density is determined from the Grand Paroise tables, depending on concentration and temperature. The foreman calculates, the quantity of acid, expressed in 100%, produced during that shift, and records it in the Daily Production report**.** In order to control these figures, the Crosschecking calculation of the nitric acid production amount is performed at the end of each month. Information that specifies month-end stock, incoming quantities, outgoing quantities and month-end stock is accumulated by the Technical–Production Department. On the basis of this information, the calculated consumption of ammonia for obtaining nitric acid, the calculated consumption of ammonia for obtaining the ammonium nitrate in all the four grades (porous, fertilizer, technical and solution), and the calculated consumption of nitric acid for obtaining the ammonium nitrate in all four grades are determined. The calculated value is compared to the value measured by the flow meters. If production deviation, calculated by means of the two methods, is below 5 %, it is considered that the nitric acid production measured by float and level gauge system is confirmed. Otherwise, an additional internal inquiry should be performed.
QA/QC procedures to be applied:	Critical instruments are checked on a routine basis according to the plant' maintenance program.
Any comment:	Total production over project period. This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**AFR (Ammonia Flow Rate to the Oxidation Reactor)**
Data unit:	kg NH_3/hour
Description:	Ammonia flow rate to the ammonia oxidation reactor
Time of determination/monitoring	Over the baseline period and will be verified during the verification visit.
Source of data to be used:	Monitored by plant automated control system. Recorded every hour.
Value of data applied (for ex ante calculations/determination)	Not applicable. We do not use this parameter to estimate expected emission reductions. We use this parameter only to eliminate baseline data that are measured during hours when the operating conditions are outside the permitted range.
Justification of the choice of data or description of	The flow is measured by a Honeywell T3000 controller transmitter.

measurement methods and procedures (to be) applied: :	
QA/QC procedures to be applied:	Critical instruments are calibrated on a routine basis according to the plant' maintenance program.
Any comment:	To be compared with normal operating conditions during the entire baseline period. This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**UNC (Overall Uncertainty of the Monitoring System)**
Data unit:	%
Description:	Overall measurement uncertainty of the monitoring system
Time of determination/monitoring	Will be defined on the basis of the report of the QAL2 test performed before the baseline period. The report will be verified during the verification visit.
Source of data to be used:	Calculation of the combined uncertainty of the applied monitoring equipment. Calculated once after the monitoring system is commissioned.
Value of data applied (for ex ante calculations/determination)	Will be defined on the base of QAL2 test
Justification of the choice of data or description of measurement methods and procedures (to be) applied:	The overall uncertainty is calculated as the combined uncertainty of the flow meter and N_2O analyzer.
QA/QC procedures to be applied:	QAL2 performed by an ISO 17025 accredited lab.
Any comment:	This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**AIFR (Ammonia to Air Ratio)**
Data unit:	kg HNO_3/kg air
Description:	Ammonia to air ratio
Time of	Recorded every hour over the period of the baseline period and will be verified during the verification visit.

determination/monitoring	
Source of data to be used:	Monitored (plant automated control system)
Value of data applied (for ex ante calculations/determination)	Not applicable. We do not use this parameter to estimate expected emission reductions. We use this parameter only to eliminate baseline data that are measured during hours when the operating conditions are outside the permitted range.
Justification of the choice of data or description of measurement methods and procedures (to be) applied:	The ammonia to air ratio is calculated on the basis of the actual flow analysis from the individual streams (ammonia and air). Air flow to the oxidation reactor is measured by a Honeywell T3000 controller transmitter.
QA/QC procedures to be applied:	Critical instruments are calibrated on a routine basis according to the plant' maintenance program.
Any comment:	To be compared with normal operating conditions during the entire baseline period. This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**PL_{BL} (Baseline period Length)**
Data unit:	$tHNO_3$
Description:	Baseline Period length is defined as production of minimum 5,000 tonnes of nitric acid at 100%.
Time of determination/monitoring	Production recorded daily over the period of the baseline period and will be verified during the verification visit.
Source of data to be used:	Production log. Calculated on the basis of recorded daily values, compiled for the entire period.
Value of data applied (for ex ante calculations/determination)	min. 5,000 tonnes
Justification of the choice of data or description of measurement methods and procedures (to be) applied:	Daily production is measured by a float-type level indicator.
QA/QC procedures to be applied:	Not applied
Any comment:	Baseline period length is calculated once at the end of the baseline period. This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**OT_h (Oxidation Temperature for Each Hour)**
Data unit:	ºC
Description:	Oxidation temperature for each hour
Time of determination/monitoring	Recorded every hour over the period of the baseline period and will be verified during the verification visit.
Source of data to be used:	Monitored (plant automated control system)
Value of data applied (for ex ante calculations/determination)	Not applicable. We do not use this parameter to estimate expected emission reductions. We use this parameter only to eliminate baseline data that are measured during hours when the operating conditions are outside the permitted range.
Justification of the choice of data or description of measurement methods and procedures (to be) applied:	Reactor temperature is measured by measuring loops in each reactor consisting of NiCr-Ni and Temperature transmitter T12.30. For determination of normal range of OT values from 3 reactors are applied.
QA/QC procedures to be applied:	Critical instruments are calibrated on a routine basis according to the plant' maintenance program.
Any comment:	To be compared with normal operating conditions during the entire baseline period. This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**OP_h (Oxidation Pressure for Each Hour)**
Data unit:	Pa
Description:	Oxidation pressure for each hour
Time of determination/monitoring	Recorded every hour during the baseline period and will be verified during the verification visit.
Source of data to be used:	Monitored (plant automated control system)
Value of data applied (for ex ante calculations/determination)	Not applicable. We do not use this parameter to estimate expected emission reductions. We use this parameter only to eliminate baseline data that are measured during hours when the operating conditions are outside the permitted range.
Justification of the choice of data or description of measurement methods and procedures (to be) applied:	Pressure is measured by an in-line Honeywell smart pressure transmitter model ST3000 with 0-4 bar measuring range.
QA/QC procedures to be applied:	Critical instruments are calibrated on a routine basis according to the plant' maintenance program.

Any comment:	To be compared with normal operating conditions during the entire baseline period. This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**GS_{BL} (Gauze Supplier)**
Data unit:	Name of gauze supplier
Description:	Gauze supplier for the baseline period
Time of determination/monitoring	Once for the baseline period and will be verified during the verification visit.
Source of data to be used:	Nitric acid plant procurement office on the basis of delivery documents
Value of data applied (for ex ante calculations/determination)	Umicore, Heraeus. We do not use this parameter to estimate expected emission reductions. We use it to verify the gauze supplier, to evaluate whether it meets methodology requirements. Recorded once.
Justification of the choice of data or description of measurement methods and procedures (to be) applied:	Cover of supply contract or bill for gauzes for baseline period, or equivalent document to prove commercial transaction.
QA/QC procedures to be applied:	None.
Any comment	This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**GC_{BL} (Gauze Composition)**
Data unit:	% precious metals.
Description:	Gauze composition for the baseline period
Time of determination/monitoring	Once for the baseline period and will be verified during the verification visit.
Source of data to be used:	Nitric acid plant procurement office on the basis of delivery documents
Value of data applied (for ex ante calculations/determination)	Pt 95%, Rh 5%. We do not use this parameter to estimate expected emission reductions. We use it to verify the gauze supplier, to evaluate whether it meets methodology requirements.
Justification of the choice of data or description of measurement methods and	Section of supply contract for gauzes that specifies the technical characteristics agreed during the baseline period.

procedures (to be) applied:	
QA/QC procedures to be applied:	None.
Any comment:	This information will be available in electronic records and on paper for at least 2 years after the last transfer of ERUs for the project.

Data/Parameter:	**EF_{BP} (Calculated Baseline Emission Factor)**
Data unit:	t N_2O/t 100% HNO_3
Description:	Baseline emission factor calculated from monitored data for the baseline period
Time of determination/monitoring	Calculated at least once after the baseline period
Source of data to be used:	Calculated from monitoring data
Value of data applied (for ex ante calculations/determination)	0.007 t N_2O/t 100% HNO_3 on the base of IPCC estimations
Justification of the choice of data or description of measurement methods and procedures actually applied:	Calculated from monitored data on the basis of the methodology
QA/QC procedures to be applied:	No QA/QC procedure is needed.
Any comment:	Baseline emission factor will be calculated on the basis of measurements of the nitric acid production, stack gas flow rate, N_2O concentration, and the operating hours.

Data/Parameter:	**EF_{BL} (Baseline Emission Factor)**
Data unit:	t N_2O/t 100% HNO_3
Description:	Defined on the base of the **D.1.1.4.**
Time of determination/monitoring	Defined once after the baseline period
Source of data to be used:	Calculated from data
Value of data applied (for ex	0.007 t N_2O/t 100% HNO_3 on the base of IPCC estimations

ante calculations/determination)	
Justification of the choice of data or description of measurement methods and procedures actually applied:	Calculated from monitored data on the basis of the methodology
QA/QC procedures to be applied:	No QA/QC procedure is needed.
Any comment:	Baseline emission factor will be calculated on the basis of measurements of the nitric acid production, stack gas flow rate, N_2O concentration, and the operating hours.

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

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Baseline emission procedure

The baseline emissions of this project will be established on the basis of nitric acid production and an IPCC default emission factor.

Establishing a baseline emission factor through continuous monitoring of both N_2O concentration and gas flow volume in the stack of the nitric acid plant for one complete campaign before project implementation (as suggested by approved CDM methodology AM0034) is not acceptable for this project, considering that the baseline measurement may take up to the end of the year 2012 and no emission reductions would be produced within the first commitment period of the Kyoto Protocol. The long lifetime of the catalytic gauzes and low production of the plant suggest that the end of the current production period may be beyond the end of 2012. Thus, a conservative project-specific baseline approach has been developed.

The baseline emissions will be estimated with an IPCC default emission factor. For medium pressure nitric acid plants IPCC suggests a factor of 7 kg±20% $N_2O/tHNO_3$. The applicability of this default emission factor will be checked against actual N_2O emissions during baseline period measurements with length equal to minimum 5,000 tonnes of 100% nitric acid.

To ensure the conservativeness:

If calculated emission factor is equal or higher than 7.7 kg (medium pressure IPCC factor +10%) $N_2O/tHNO_3$, default medium pressure IPCC emission factor 7kg $N_2O/tHNO_3$ is used.

If calculated emission factor is equal or higher than 6.3 kg $N_2O/tHNO_3$ (lower limit of medium pressure IPCC factor +10%), then the lower end of the uncertainty range will be used, which is 5.6 kg $N_2O/tHNO_3$.

Otherwise, the lowest default emission factor for nitric acid plants that do not have N_2O abatement system or NSCR of 4.5 $N_2O/tHNO_3$ shall be applied.

Ammonia oxidation reactors at Nitroporos use 3 layers of platinum gauzes that are replaced consecutively (one or two gauzes per stop). At the end of operational life the oldest gauze(s) layer is replaced by a new one. The other two (or one) gauze layers remain in the reactor and are moved down to lower positions, whereas the new gauze layer is installed at the top. The same procedure is performed at all 3 reactors simultaneously, so 3 or 6 gauze layers are replaced during one maintenance stop (1-2 gauze layers in each reactor). The composition of old and new gauzes in all reactors is the same. The baseline period measurements should be performed when at least 3 of 9 gauzes are in the first part their life. The project period could start immediately after the end of the baseline period.

1. Determination of the permitted operating conditions of the nitric acid plant to avoid overestimation of baseline emissions:

Oxidation temperature

The historical data from date of plant start-up in October 2009 until the date of start-up of baseline period are used to calculate the “permitted range of operating conditions” for operating temperature, this range is determined through a statistical analysis in which the time series data are to be interpreted as a sample for a stochastic variable. All data that fall within the upper and lower 2.5% percentiles of the sample distribution are defined as abnormal and will be eliminated. The permitted range of operating temperature is then assigned as the historical minimum (value of parameter below which 2.5% of the observations lie) and maximum operating conditions (value of parameter exceeded by 2.5% of observations).

Oxidation pressure

Pressure at the oxidation reactors is not a process control parameter, therefore values from plant design diagram and internal production manual are applied.

Ammonia gas flow rate and ammonia-to-air ratio input into the ammonia oxidation reactor

The upper limits for ammonia flow rate and ammonia-to-air ratio are determined using historical maximum operating data for hourly ammonia gas and ammonia-to-air ratio for the period going from plant start-up to the date of AMS installation.

2. Determination of baseline emission factor: measurement procedure for N_2O concentration and gas volume flow

For the determination of the baseline emission factor N_2O concentration and gas volume flow will be monitored throughout the baseline period. Separate readings for N_2O concentration and gas flow volume for a defined period of time (e.g., every hour of operation, it provides an average of the measured values for the previous 60 minutes) will be taken. Error readings (e.g., downtime or malfunction) and extreme values will be eliminated from the output data series.

Measurement results can be distorted before and after periods of downtime or malfunction of the monitoring system and can lead to maverick data. To eliminate such extremes and to ensure a conservative approach, the following statistical evaluation is to be applied to the complete data series of N_2O concentration and the data series for gas volume flow. The statistical procedure will be applied to data obtained after eliminating data measured for periods when the plant operated outside the permitted ranges:

a) Calculate the sample mean (x);
b) Calculate the sample standard deviation (s);
c) Calculate the 95% confidence interval (equal to 1.96 times the standard deviation);
d) Eliminate all data that lie outside the 95% confidence interval;
e) Calculate the new sample mean from the remaining values (volume of stack gas (VSG) and N_2O concentration of stack gas (NCSG)).

Then, the average mass of N_2O emissions per hour is estimated as the product of NCSG and VSG. The N_2O emissions per period are estimated as the product of N_2O emission per hour and the total number of complete hours of operation of the period using the following equation from AM0034:

$$BE_{BC} = VSG_{BC} \cdot NCSG_{BC} \cdot 10^{-9} \cdot OH_{BC}$$

Where

BE_{BP}	Total baseline emissions in the baseline measurement period, in tN_2O
VSG_{BP}	Mean stack gas volume flow rate in the baseline measurement period, in Nm^3/h
$NCSG_{BP}$	Mean concentration of N_2O in the stack gas in the baseline measurement period, in mg N_2O/Nm^3
OH_{BP}	Number of operating hours in the baseline measurement period, in h

The plant-specific baseline emission factor representing the average N_2O emissions per tonne of nitric acid over one period is derived by dividing the total mass of N_2O emissions by the total output of 100% concentrated nitric acid for that period for baseline emission factor determination.

The overall measurement uncertainty of the monitoring system, expressed as a percentage (UNC), will be used to reduce the N_2O emission factor per tonne of nitric acid produced in the baseline period (EF_{BL}) as follows:

$$EF_{BC} = \frac{BE_{BC}}{NAP_{BC}}\left(1 - \frac{UNC}{100}\right)$$

Where

EF_{BP}	Calculated Baseline emission factor, in $tN_2O/tHNO_3$
NAP_{BP}	Nitric acid production during the baseline period, in $tHNO_3$
UNC	Overall measurement uncertainty of the monitoring system, in %, calculated as the combined uncertainty of the applied monitoring equipment

If EF_{BP} >7.7 kg N2O/tHNO3 EF_{BL} = 7 kg N2O/tHNO3
If 6.3<EF_{BP}<7.7 kg N2O/tHNO3 EF_{BL} = 5.6 kg N2O/tHNO3
If EF_{BP}<6,3 kg N2O/tHNO3 EF_{BL} = 4.5 kg N2O/tHNO3

Impact of regulations

Should N_2O emission regulations that apply to nitric acid plants be introduced in Romania or the jurisdiction covering the location of the nitric acid plant, such regulations shall be compared to the calculated baseline emission factor (EF_{BL}), regardless of whether the regulatory level is expressed as:

- An absolute cap on the total volume of N_2O emissions for a set period;
- A relative limit on N_2O emissions expressed as a quantity per unit of output; or
- A threshold value for specific N_2O mass flow in the stack.

In this case, a corresponding plant-specific emission factor cap (maximum allowed $tN_2O/tHNO_3$) is to be derived from the regulatory level. If the regulatory limit is lower than the baseline factor determined for the project activity, the regulatory limit will become the new baseline emission factor, that is:

If $EF_{BL} > EF_{reg}$, then $EF_{BL} = EF_{reg}$ for all the calculations.

Composition of the ammonia oxidation catalyst

In the case that in the Nitroporos plant the composition of the ammonia oxidation catalyst used for the baseline period and after the implementation of the project is identical to that used in the period for setting the operating conditions, there shall be no limitations on N_2O baseline emissions. Plant uses gauzes identical compositions from 2 suppliers: Umicore and Heraeus.

Parameters to be monitored for composition of the catalyst are as follows:

GS_{normal} Gauze supplier for the operating condition period
GS_{BP} Gauze supplier for the baseline period
$GS_{project}$ Gauze supplier for the project period
GC_{normal} Gauze composition for the operating condition period
GC_{BP} Gauze composition for the baseline period
$GC_{project}$ Gauze composition for the project period

Monitoring Periods

N_2O Project emissions are monitored continuously. Verification of emission reductions performed periodically (e.g. once per year)

D. 1.2. Option 2 – Direct monitoring of emission reductions from the project (values should be consistent with those in Section E):

>>
Not applicable

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

>>
The emission reductions of the project activity, *ER*, expressed in tonnes of CO_2 equivalent per year (tCO_2e/yr), are given by the following equation (Eq. 7 from AM0034):

$$ER_n = (EF_{BL} - EF_p) \cdot NAP_n \cdot GWP_{N_2O}$$

Where

ER_{annual}	Emission reductions for the *nth* year , tCO_2e
EF_{BL}	Baseline emission factor, in $tN_2O/tHNO_3$
EF_p	Project emission factor, in $tN_2O/tHNO_3$
NAP_{annual}	Nitric acid production during the *nth* year of the project activity, in $tHNO_3$
GWP_{N_2O}	Global warming potential of N_2O, set as 310 tCO_2e/tN_2O for the 1st commitment period

Note. The nitric acid production used to calculate emission reductions should not exceed the design capacity (nameplate) of the nitric acid plant.

Documentation to prove design capacity (nameplate) of the nitric acid plant should be available for the validation process of the project activity.[2]

---

[2] Nameplate (design) implies the total yearly capacity (considering 365 days of operation per year) according to the documentation of the plant technology provider (such as the Operation Manual). If the plant has been modified to increase production, and such de-bottleneck or expansion projects were completed before December 2005, then the new capacity is considered nameplate, provided proper documentation of the projects is available (such as, but not limited to: properly dated engineering plans or blueprints, engineering, materials and/or equipment expenses, or third party construction services, etc.).

D.1.3. Treatment of leakage in the monitoring plan:

>>
No leakage calculation is required.

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO_2 equivalent):

>>
No leakage calculation is required.

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

>>

To define EF_{BL} firstly we calculate

$$BE_{BC} = VSG_{BC} \cdot NCSG_{BC} \cdot 10^{-9} \cdot OH_{BC}$$

Where

BE_{BP}	Total baseline emissions in the baseline measurement period, in tN_2O
VSG_{BP}	Mean stack gas volume flow rate in the baseline measurement period, in Nm^3/h
$NCSG_{BP}$	Mean concentration of N_2O in the stack gas in the baseline measurement period, in mg N_2O/Nm^3
OH_{BP}	Number of operating hours in the baseline measurement period, in h

and after that

$$EF_{BC} = \frac{BE_{BC}}{NAP_{BC}}(1 - \frac{UNC}{100})$$

Where

EF_{BL}	Baseline emission factor, in $tN_2O/tHNO_3$
BE_{BP}	Total baseline emissions in the baseline measurement period, in tN_2O
NAP_{BP}	Nitric acid production during the baseline period, in $tHNO_3$
UNC	Overall measurement uncertainty of the monitoring system, in %, calculated as the combined uncertainty of the applied monitoring equipment

If EF_{BP} >7.7 kg N2O/tHNO3 EF_{BL} = 7 kg N2O/tHNO3
If 6.3<EF_{BP}<7.7 kg N2O/tHNO3 EF_{BL} = 5.6 kg N2O/tHNO3
If EF_{BP}<6,3 kg N2O/tHNO3 EF_{BL} = 4.5 kg N2O/tHNO3

<u>To estimate </u>"ex-ante" <u>EF_p</u> first we calculate

$$PE_n = (VSG_{BP} \cdot NCSG_{BP}) * (1 - R_{Eff}) / 100 \cdot 10^{-9} \cdot OH$$

Where

PE_n	Estimated N_2O emission for the project period, tN_2O
VSG_{BP}	Mean stack gas volume flow rate in the baseline measurement period, in Nm^3/h
$NCSG_{BP}$	Mean concentration of N_2O in the stack gas in the baseline measurement period, in mg N_2O/Nm^3
R_{Eff}	Secondary catalyst efficiency, %
OH	Estimated number of operating hours in the project period, in h

and after that

$$EF_p = \frac{PE_n}{Pl_n}$$

Where

EF_p	Estimated project emission factor, in $tN_2O/tHNO_3$
PE_n	Estimated N_2O emission for the project period, in tN_2O
PL_n	Project period length, in $tHNO_3$

Then we can calculate ER_n:

$$ER_n = (EF_{BL} - EF_p) \cdot NAP \cdot GWP_{N_2O}$$

Where

ER_n	Emission reductions for the *nth* period, in tCO_2e
EF_{BL}	Baseline emission factor, in $tN_2O/tHNO_3$
EF_p	Estimated project emission factor, in $tN_2O/tHNO_3$
NAP_n	Estimated nitric acid production during the *nth* project period
GWP_{N2O}	Global warming potential of N_2O, set as 310 tCO_2e/tN_2O for the 1^{st} commitment period

D.1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the project:

>>

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:

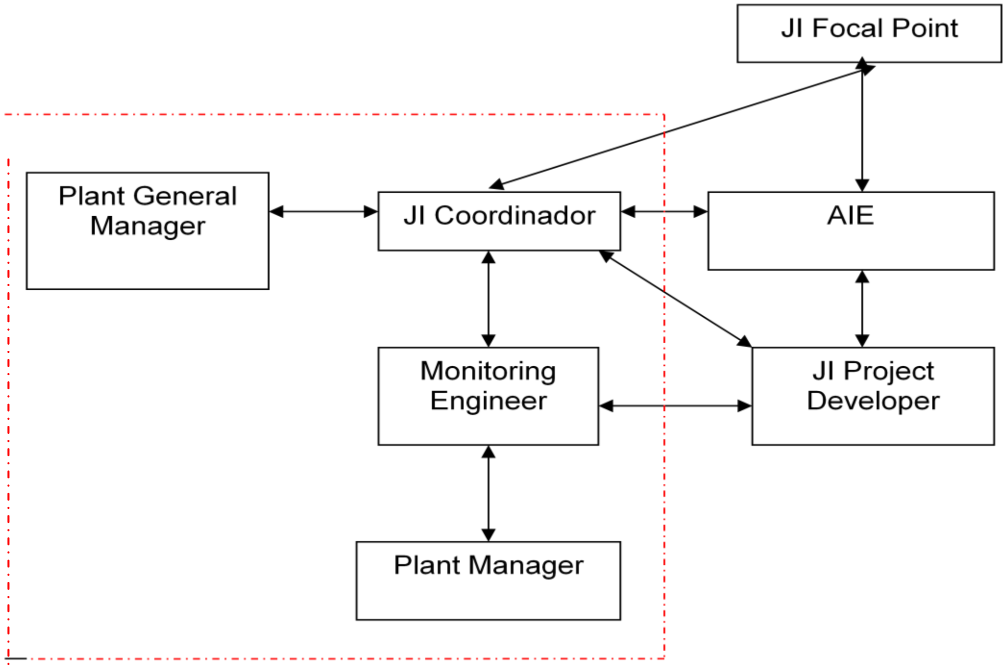
>>

QC/QA procedures are described directly in the tables for each data and parameter.

D.3. Please describe the operational and management structure that the project operator will apply in implementing the monitoring plan:

>>

An illustrative scheme of the operational and management structure that will monitor the proposed JI project activity is depicted below.



Note: the dashed line shows the operational and management structure boundaries of the proposed project.

D.4. Name of person(s)/entity(ies) establishing the monitoring plan:

>>

The baseline and monitoring methodology has been applied by:
Sergii Klibus, Nuria Zanzottera, and María Inés Hidalgo, MGM International Group LLC (not project participant).
Tel: +380-50-221-66-55
e-mail: sklibus@mgminter.com; nzanzottera@mgminter.com; ihidalgo@mgminter.com.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

>>

Ex-ante estimation of emission reductions

For completing this PDD with the estimation of project emissions the following assumptions are used:

- These estimated amounts are calculated on the basis of the Nitroporos plant road map figures: 2011 - 70,000 t/year, 2012 – 115,000 t/year, 2013 – 154,000 t/year, 2014 – 168,000 t/year, 2015 – 175,000 t/year, 2016-2020 – 218,000 t/year
- The potential technology provider (BASF) indicates that the guaranteed reduction efficiency to be achieved as a consequence of project implementation is 83%. ($EF_P = 0.17 * EF_{BL}$).
- As measured emission factor is used IPCC upper limit default emission factor for N_2O emissions for medium pressure nitric acid plants that is equal to 8,4 kg $N_2O/tHNO_3$.concervative EF in accordance with section D1.1.3 in this case will be equal to EF_{BL} = 7 kg $N_2O/tHNO_3$. Nevertheless for calculation of ex ante project emissions we use 8,4 kg $N_2O/tHNO_3$ emission factor, to provide values of real emissions.

$$PE_{annual} = PE_{BL} \cdot 0.17 \cdot NAP_n \cdot GWP_{N_2O}$$

Where

PE_{annual}	Project emissions during the vintage year of the project activity, tCO_2
PE_{BL}	Baseline period emission factor, in $tN_2O/tHNO_3$
NAP_{annual}	Nitric acid production during the vintage year of the project activity, in $tHNO_3$
GWP_{N_2O}	Global warming potential of N_2O

For example, for years 2016-2020:

$$PE_n = 0.0084 \cdot 0.17 * 218{,}000 \cdot 310 = 96{,}504 tCO_2e / year$$

E.2. Estimated leakage:

>>

Not applicable

E.3. The sum of E.1. and E.2.:

>>

As there is no leakage the sum of E.1 and E.2 is equal to E.1.

E.4. Estimated baseline emissions:

>>

Baseline emissions are estimated according to the following assumptions:

- Nitric acid production is assumed to be constant, so that project emissions do not vary from year to year.
- An N_2O ex ante emission factor (EF_{BL})

$$BE_{annual} = EF_{BL} \cdot NAP_{annual} \cdot GWP_{N_2O}$$

Where

BE_{annual}	Baseline emissions during the vintage year of the project activity, tCO_2
EF_{BL}	Baseline emission factor, in $tN_2O/tHNO_3$
NAP_{annual}	Nitric acid production during the vintage year of the project activity, in $tHNO_3$

GWP_{N_2O}	Global warming potential of N_2O

For example for years 2016-2020:

$$BE_{annual} = 0.0070 \cdot 218{,}000 \cdot 310 = 473{,}060\, tCO_2e / year$$

E.5. Difference between E.4. and E.3. representing the emission reductions of the project:

>>

$$ER_n = (EF_{BL} - EF_p) \cdot NAP_n \cdot GWP_{N_2O}$$

Where

ER_{annual}	Emission reductions for the *nth* year , tCO_2e
EF_{BL}	Baseline emission factor, in $tN_2O/tHNO_3$
EF_p	Project emission factor, in $tN_2O/tHNO_3$
NAP_{annual}	Nitric acid production during the vintage year of the project activity, in $tHNO_3$
GWP_{N_2O}	Global warming potential of N_2O

For example, for years 2016-2020:

$$ER_{annual} = (0.0070 - 0.001428) \cdot 218{,}000 \cdot 310 = 300{,}355\, tCO_2e / year$$

E.6. Table providing values obtained when applying formulae above:

>>

Years	Estimated project activity emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of $CO_{2\,e}$ equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
2011	15,494	-	75,950	60,456
2012	50,908	-	249,550	198,642
2013	68,173	-	334,180	266,007
2014	74,370	-	364,560	290,190
2015	77,469	-	379,750	302,281
2016	96,504	-	473,060	376,556
2017	96,504	-	473,060	376,556
2018	96,504	-	473,060	376,556
2019	96,504	-	473,060	376,556
2020	96,504	-	473,060	376,556
Total	768935	**-**	3769290	3000355

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the host Party:

>>

In accordance with Government Decision no. 445/2009 on the environmental impact assessment of certain public and private projects, it is not necessary to perform an EIA for this JI project. This is confirmed by Sibiu

Regional environmental agency decision N5242/15.12.201 regarding the Environmental Impact Assessment of the project.

Nevertheless, for Nitroporos an environmental impact study was voluntarily carried out by SC IPROCHIM SA Bucharest in November 2010 (Nr of project MD 1002.04).

As a general conclusion, following the analysis of the evaluation report on the impact on the environment based on the data provided by the company, the impact is placed at an insignificant level.

Due to Nitroporos plant modernization, the air quality in the area will improve. This will have a positive impact on staff health and safety as well as on the environmental factors water, soil and subsoil.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to supporting documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

SECTION G. Stakeholders' comments

G.1. Information on stakeholders' comments on the project, as appropriate:

>>

In accordance with Romanian legislation it is not necessary for Nitroporos to carry out a stakeholders' comment process. Nevertheless, information on this project was published in the local newspaper, Buna Ziua Fagaras (16 November 2010 and 10 December 2010) and on SC NITROPOROS SRL's site www.nitroporos.ro. No comments have been received on these articles.

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Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

MONITORING PLAN

The current JI project “Nitrous Oxide Abatement Project at Nitroporos plant” measures on a quasi-continuous basis (uninterrupted sampling of flue gases with concentration and normalized flow analysis for short, discrete time periods) the N_2O mass flow leaving the nitric acid plant through an automated measuring system (AMS[3]) using technologies and procedures in accordance with AM0034: “Catalytic reduction of N_2O inside the ammonia burner of nitric acid plants”.

The plant manager is responsible for the ongoing operation and maintenance of the N_2O monitoring system. Operation, maintenance, calibration and service intervals are according to the manufacturer’ specifications and international standards. Measuring equipment that is involved in the monitoring process is properly checked and calibrated. Procedures of maintenance, calibration routines, and checking for availability of spare parts will be clearly described in “Working procedure for monitoring data regarding the greenhouse gas emissions (N_2O) of the nitric acid plant”.

The proposed JI project is closely monitored, metered and recorded. The management and operation of the nitrous oxide abatement project is the responsibility of the plant. The emission reductions will be verified at least annually by an Accredited Independent Entity (AIE). A regular (annual) reporting of the emission reductions generated by the project will be sent to the owner of the ERUs, coincidentally with the AIE determination.

Training required as a consequence of the JI project implementation has been developed and included as part of the JI project manual. Monitoring of the national regulations related to NO_x and N_2O (as required by AM0034) is also established as a written procedure and integrated into the project’ JI manual.

Tables in Sections D.1.1.1 and D.1.1.3 of the PDD describe the parameters to be acquired and recorded according to the current monitoring plan, for both the baseline period and project periods. Furthermore, the baseline methodology requires that certain process parameters are monitored (to be compared with the permitted operating conditions) during the baseline period; such process parameters are also described in those tables. Only those N_2O measurements taken when the plant is operating within the permitted range are considered during the calculation of baseline emissions.

In the selection of downstream measuring points the following issues were considered: temperature of the gas below 300ºC (N_2O inert), assurance of homogeneity of the volume gas flow at the measuring points throughout the diameter in terms of velocity of flow and mass composition of gas flow; possible turbulences in the gas flow stream (e.g., at the stack walls); if inhomogeneities exist, measuring of the gas flow is conducted with specific measuring equipment that minimizes uncertainties and inhomogeneities (e.g., multiple probe measuring units that allow for a representative coverage of the gas flow across the stack diameter). The measuring point is the points of the plant with easy access behind the gas expander turbine where the gas flow streams are consistent. To secure proper correct selection of the sample points, in Nitroporos they have been determined by an accredited institution SGS Nederland BV.

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[3] According to “terms and definitions” of EN 14181:2004 (E), an AMS is: a measuring system permanently installed on site for continuous monitoring of emissions. An AMS is a method which is traceable to a reference method. Apart from the analyzer, an AMS includes facilities for taking samples and for sample conditioning. This definition also includes testing and adjusting devices that are required for regular functional checks.

The specific data generated by the AMS will be stored on a dedicated data acquisition system (DAS) at specified time intervals. The DAS automatically provides hourly averages, which are stored in the electronic media. .

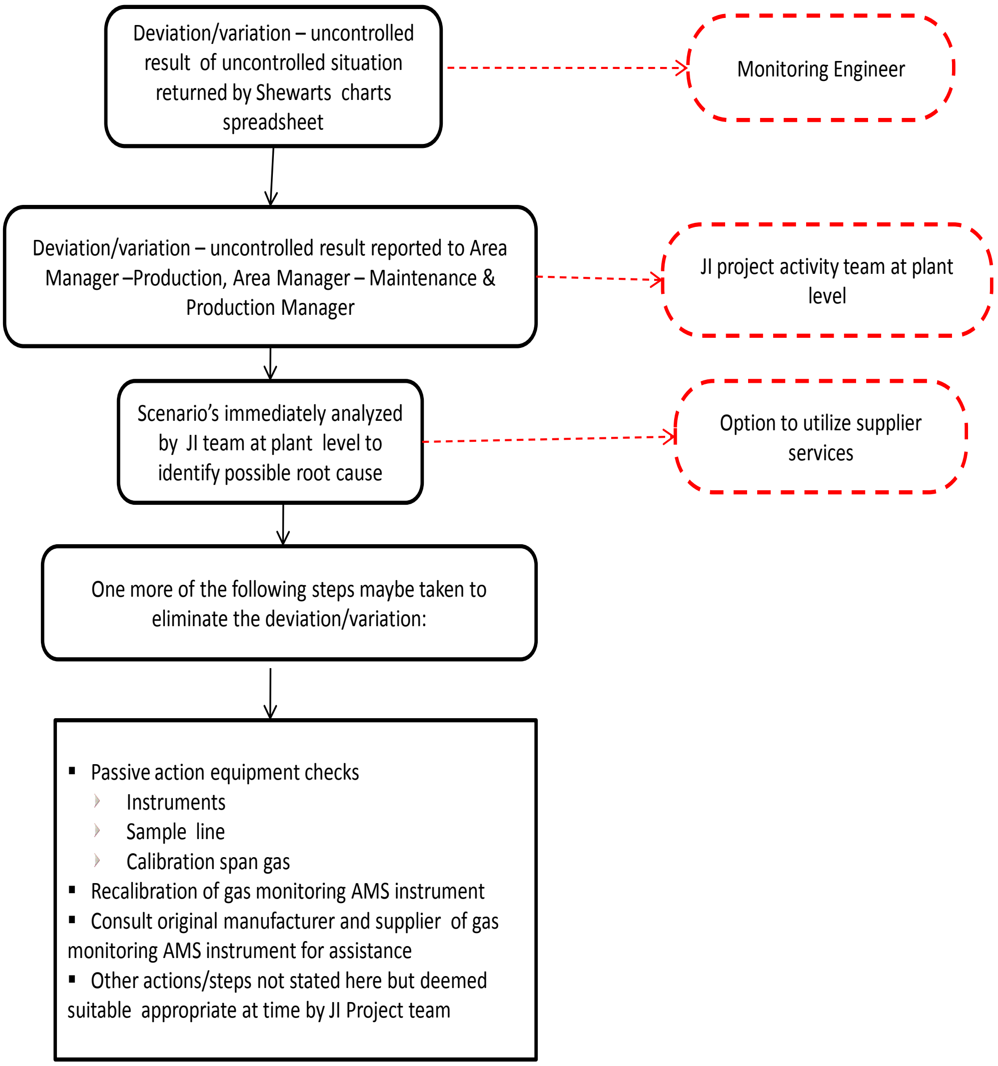
The system is designed to be operated automatically and for the daily operation of the system operator is not required. However, the monitoring engineer will ensure that the system is in normal operation and take necessary action to follow the MP. The data acquisition and processing system is protected by the processing security system without any possibility of interference with any parameter. The safety of the system is ensured by a program (software) furnished by the analyzer supplier.

The monitoring data are stored simultaneously on several hard disks to prevent the loss of data in case one hard disk fails. The storage memory of the computer which serves the DAS can store the acquired data for a minimum of 10 years (and stores it for 2 years after the end of the crediting period in accordance with methodology AM0034). Daily, printers generate a paper report which is sent to the personnel responsible for data storage in the IT department.

Weekly, the data are gathered, stored and transmitted to the operator responsible for storing the data. The operator generates, on the basis of the program received from the JI developer, a report which is submitted to the JI developer too.

In the event that the monitoring system is down, the lowest between the conservative IPCC (4.5 kg N_2O / ton nitric acid) or the last measured value will be valid and applied for the downtime period for the baseline calculated emission factor, and the highest measured value in the project period will be applied for the downtime period for the project period emission factor.

In case of any malfunction (as for example malfunction of measuring equipment, no signal etc.) the personnel acts in accordance with an illustrative scheme of the basic operational procedure that will identify and eliminate any possible malfunctions (deviations, variations, etc.) of the gas monitoring AMS instrument as part of the JI project activities at the Nitroporos plant:



Emission reduction calculations

The mass (in tonnes) of N_2O that the project actually avoids being vented to the atmosphere during each production period, expressed in tonnes of carbon dioxide equivalent (or tCO_2e), will be calculated by applying the following formulas:

$$BE_{BC} = VSG_{BC} \cdot NCSG_{BC} \cdot 10^{-9} \cdot OH_{BC}$$

Where

BE_{BP}	Total baseline emissions in the baseline measurement period, in tN_2O
VSG_{BP}	Mean stack gas volume flow rate in the baseline measurement period, in Nm^3/h
$NCSG_{BC}$	Mean concentration of N_2O in the stack gas in the baseline measurement period, in mg N_2O/Nm^3
OH_{BP}	Number of operating hours in the baseline measurement period, in h

$$EF_{BC} = \frac{BE_{BP}}{NAP_{BP}}(1 - \frac{UNC}{100})$$

Where

EF_{BC}	Calculated baseline emission factor, in $tN_2O/tHNO_3$
NAP_{BC}	Nitric acid production during the baseline period, in $tHNO_3$
UNC	Overall measurement uncertainty of the monitoring system, in %, calculated as the combined uncertainty of the applied monitoring equipment

If $EF_{BP} > 7.7$ kg $N_2O/tHNO_3$ $EF_{BL} = 7$ kg $N_2O/tHNO_3$
If $6.3 < EF_{BP} < 7.7$ kg $N_2O/tHNO_3$ $EF_{BL} = 5.6$ kg $N_2O/tHNO_3$
If $EF_{BP} < 6{,}3$ kg $N_2O/tHNO_3$ $EF_{BL} = 4.5$ kg $N_2O/tHNO_3$

Project emissions are calculated from mean values of N_2O concentration and total flow rate:

$$PE_n = VSG_n \cdot NCSG_n \cdot 10^{-9} \cdot OH_n$$

Where

PE_n	Total project emissions of the nth period, in tN_2O
VSG_n	Mean stack gas volume flow rate for the nth project period, in Nm^3/h
$NCSG_n$	Mean concentration of N_2O in the stack gas for the project period, in mg N_2O/Nm^3
OH_n	Number of operating hours in the project period, in h

For the *nth* period, the period specific emission factor would be:

$$EF_n = \frac{PE_n}{NAP_n}$$

Where

EF_n	Emission factor calculated for the *nth* period, in kg N_2O/t HNO_3
PE_n	Total project emissions of the *nth* period, in tN_2O
NAP_n	Nitric acid production in the *nth* period, in t 100% HNO_3

Then

$$ER_n = (EF_{BL} - EF_p) \cdot NAP_n \cdot GWP_{N_2O}$$

Where

ER_n	Emission reductions of the project for the *nth* period, tCO_2e
EF_{BL}	Baseline emission factor, in $tN_2O/tHNO_3$
EF_p	Project emission factor, applicable to the *nth* period, in $tN_2O/tHNO_3$
NAP_n	Nitric acid production during the *nth* period of the project activity, in $tHNO_3$
GWP_{N_2O}	Global warming potential of N_2O, set as 310 tCO_2e/tN_2O for the 1st commitment period

Following AM0034, several restrictions and adjustments will be applied to the formulas above, including the following:

1. All data series are filtered to eliminate mavericks and outliers.

   The monitoring system will provide separate readings for N_2O concentration and gas flow for a defined period of time (e.g., every hour of operation, i.e., an average of the measured values of the past 60 minutes). Error readings (e.g., downtime or malfunction) and extreme values are eliminated from the output data series. Next, the same statistical evaluation that was applied to the baseline data series will be applied to the project data series:

a) Calculate the sample mean (x);
b) Calculate the sample standard deviation (s);
c) Calculate the 95% confidence interval (equal to 1.96 times the standard deviation);
d) Eliminate all data that lie outside the 95% confidence interval;
e) Calculate the new sample mean from the remaining values.

2. NAP (nitric acid production) cannot exceed nameplate capacity of the plant.

   Nitric acid production will be compared to nameplate capacity. If nitric acid production in a given period is larger than nameplate, then emission reductions will be calculated ignoring data generated after production exceeds nameplate.

3. A moving average of the emission factors (EF_{ma}) must be calculated.

   The period specific emission factor (EF_n) for each period during the project' crediting period is compared to a moving average emission factor calculated as the average emission factor of the factors generated in the previous periods ($EF_{ma,n}$).

   To calculate the total emission reductions achieved in the *nth* period, the higher of the two values $EF_{ma,n}$ and EF_n shall be applied as the emission factor relevant for that particular period (EF_p).

4. A minimum project emission factor should also be determined (EF_{min}), defined as the lowest among the emission factors of the first 10 periods.

   After the first ten periods of the crediting period of the project, the lowest emission factor (EF_n) observed during those periods will be adopted as a minimum (EF_{min}). If any of the later project periods results in an EF_n that is lower than EF_{min}, the calculation of the emission reductions for that particular period will use EF_{min} and not EF_n.

5. The emission factor to be applied for a particular period calculation (EF_p) must be the higher between the above-mentioned moving average and the specific period emission factor (and not lower than minimum emission factor, after 10 periods).

   This will be checked according to procedures detailed in Steps 4 and 5 above.

6. The level of uncertainty (*UNC*) determined for the AMS installed must be deducted from the baseline emission factor.

   The overall measurement uncertainty (*UNC*), calculated by summing in an appropriate manner (using Gauss' law of error propagation) all the relevant uncertainties arising from the individual performance characteristics of the AMS components, will be used to reduce the baseline emission factor. The following formula will be applied:

$$EF_{BC} = EF \ * (1 - \frac{UNC}{100})$$

Description of the AMS

Nitroporos has installed an ABB automated monitoring system (AMS)

AMS ABB consist of N_2O analyzer, sample probe, sample conditioning system, SDF flow sensor (for stack gas flow measurement)a nd Data Acquisition System: ITBK EMI3000

1. Analyzer system

The ABB AO2000 URAS 26 analyzes N_2O concentration in gas mixes on continuously on dry basis.

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The URAS 26 is a continuous NDIR industrial photometer that can selectively measure concentrations of up to four compounds. In this system it is equipped for the measurement of N_2O only. The analyzer equipped with gas-filled opto-pneumatic cell. The cell is filled by gas mixture with defined N2O concentration. Gas-filled calibration cells are used for automatic calibration. The analyzer has a QAL1 certificate.

2. Sample conditioning system

The gas sample is extracted at the sampling point, particles are removed by the heated filter unit and the clean sample gas is delivered through a heated sampling line to the analyzer cabinet. Before being fed to the analyzer, moisture is removed by the sample gas cooler and sample gas feeding unit installed side-by-side in the analyzer cabinet. This sample gas cooler unit maintains a constant dew point of the sample gas of 3°C breakthrough. The minimum flow rate to the analyzer is controlled and connected to an alarm. The dry gas after the cooler is controlled for moisture breakthrough.In case of moisture leaks due to a failure of the cooler, the sampling pump will be stopped automatically and an alarm will be given to the EMI3000 system.

3. Flow meter

The SDF flow measuring system allows continuous determination of the flow rate of stack gas on wet basis. It is performance tested according to 17.BlmSchG and “TA Luft” (test report No. 936/802015, TUV Rheinland 1993) for plants.

The SDF flow sensor is a highly sensitive system for continuous flow measurement. The stack gas flow is measured in the stack by measuring the dynamic differential pressure generated by the SDF flow sensor probe rod using ABB’ differential pressure transmitter.

Thereby the differential pressure is continuously measured and the signal is fed to the DATA Logger and ITBK EMI3000 – JI Data acquisition and data evaluation system.

The signal resulting from the differential pressure is proportional to the velocity of the exhaust flow gas.

The stack gas pressure and temperature are also measured separately by transmitters and fed to the DATA Logger input for further conversion of flow to normal conditions by EMI3000.

4. The data acquisition system

AMS transfers data to storage device and to the register system appointed to the project. Data aquisition and processing system programmed by AFRISO in accordance with AM0034 version 05.1.0.

EMI3000 system can be configured easily in accordance with unit demand or the wishes of the operator. The EMI3000 software is designed to conduct all the statistical analyses and calculations required by the methodology in order to derive the baseline and project emission factors and to calculate the amount of emission reductions resulting from the project activity.

The system includes: a specially adapted personal computer; 2 hard disks with capacity of 500 GB with RAID 1 the storage scheme for auto backup of information; operating system Microsoft® Windows® SERVERTM 2003; Ethernet; MYSQL- information bases licensed control system; PCAnywhere software; operator interface, including a remote management and software for EN14181-QAL3- monitoring. The DAS displays, calculates, evaluates, prints out and stores the measured data.

The data are stored simultaneously on several hard disks to prevent the loss of data in case one hard disk fails. The functionality, the correct calculations and statistical evaluation of the EMI3000 ——software are tested and certified by TÜV NORD.

Good monitoring practice and performance characteristics

Regarding QA/QC, the European Norm EN 14181:2004, which is recommended as guidance regarding the selection, installation and operation of the AMS under Monitoring Methodology AM0034, stipulates the Quality Assurance Levels (QAL), and one Annual Surveillance Test (AST):

QAL1: Suitability of the AMS for the specific measuring task.

The evaluation of the suitability of the AMS and its measuring procedure are described in ISO 14956:2002 "Air quality – Evaluation of the suitability of a measurement procedure by comparison with a required measuring uncertainty". Using this standard, it will be proven that the total uncertainty of the results obtained from the AMS meets the specification for uncertainty stated in the applicable regulations (e.g., EU Directives 2000/76/EU or 2001/80/EU). Since European regulations do not yet cover the measurement of N_2O at nitric acid plants, there is no official specification for uncertainty available. Hence, considering official specification of uncertainties defined for equivalent pollutants (e.g., NO_x, SO_2) according to EU regulations, 20% of the ELV (emission limit value) has been considered by the equipment manufacturer as the required measurement quality for N_2O, for the purpose of expanded uncertainty calculations. The specific performance characteristics of the monitoring system chosen by the project will be listed in the Project Design Document, in accordance with AM0034. The tables below indicate such characteristics in accordance with the corresponding QAL 1 report.

The complete EN 14181: 2004 QAL1 reports will be provided by the equipment manufacturers considering the performance characteristics as measured by a qualified Technical Inspection Authority (such as the German TÜV) and the specific installation characteristics and site conditions at the plant. The QAL1 report confirms the N_2O analyzer is suitable for performing the indicated analysis (N_2O concentration), and provides a conservative estimate for expanded uncertainty. The complete QAL1 report will be available for verification.

The overall measurement uncertainty (*UNC*) is calculated by summing (using Gauss' law of error propagation) all the relevant uncertainties arising from the individual performance characteristics of the AMS components (thus $UNC = ((N_2O \text{ analyzer uncertainty})^2 + (\text{flow meter uncertainty})^2)^{1/2}$). The overall measurement uncertainty is available for the determination of the project activity.

QAL2: Validation of the AMS following its installation.

The next level of quality assurance prescribed in EN14181:2004 (QAL2) describes a procedure for the determination of the calibration function and its variability, by means of certain number of parallel measurements (meaning simultaneously with the AMS), performed with a standard reference method (SRM) (which should be a proven and accurate[4] analytical protocol in accordance with relevant norms or legislation). The variability of the measured values obtained with the AMS is then compared with the uncertainty given by the applicable legislation. If the measured variability is lower than the permitted uncertainty, it is concluded that the AMS has passed the variability test. Since (as explained above), official uncertainty is not available, an appropriate level is determined on the basis of those that do exist for similar pollutants and techniques (in this case 20% of ELV).

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[4] Considering EN 14181 does not specify what SRM to use for each specific compound, there is controversy as to which method is suitable as SRM for N_2O, since the best available technology (and hence the most accurate instrument) is the actual online instrument which is the subject of calibration by this method.

The testing laboratories performing the measurements with the standard reference method should have an accredited quality assurance system according to EN ISO/IEC 17025 or relevant (national) standards.

As condition precedent for a QAL2 test, it is required that the AMS has been correctly installed and commissioned, considering (for example) that the AMS is readily accessible for regular maintenance and other necessary activities and that the working platform to access the AMS allows for parallel sampling.

The AMS unit will be installed by qualified contractors under the direct supervision of the equipment manufacturers, considering both relevant Romanian and international standards. The plant technical director, as well as other members of Nitroporos´ technical team, shall actively supervise all phases of installation, from system design to commissioning.

All data collected before the receipt of the QAL2 lab report shall be corrected through proper application of the calibration function.

QAL3: Ongoing quality assurance during operation.

Procedures described under QAL3 of EN 14181: 2004 checks for drift and precision, in order to demonstrate that the AMS is in control during its operations so that it continues to function within the required specification for uncertainty. This is achieved by conducting periodic zero and span checks on the AMS, and evaluating results obtained using control charts. Zero and span adjustments or maintenance of the AMS may be implemented as a result of such evaluation. The implementation and performance of the QAL3 procedures given in this standard are the responsibility of the plant operating team.

The standard deviation according to QAL3 has been calculated by the equipment manufacturer on the basis of equipment performance characteristics and field conditions for Nitroporos' nitric acid plant. Calculation spreadsheets from the suppliers will be available for verification. The data are used to monitor that the difference between measured values and true values of zero and span reference materials are equal to or smaller than the combined drift and precision value of the AMS multiplied by a coverage factor of 2 (2 times the standard deviation of the AMS, as described in the QAL3 section of EN14181) on a scheduled basis, with the aid of Shewart charts. The documented calibration procedure for the zero and span checks and the resulting Shewart charts will be available on site for future verification.

All monitoring equipment is serviced and maintained according to the manufacturer' instructions and international standards by qualified personnel. Maintenance and service logs will be well kept at Nitroporos' plant and available for auditing purposes.

AST: Annual Surveillance Test (ongoing quality assurance).

The AST is a procedure to evaluate whether the measured values obtained from the AMS still meet the required uncertainty criteria, as evaluated during the QAL2 test. Like QAL2, it also requires a limited number of parallel measurements using an appropriate Standard Reference Method. Although the total expected uncertainty of the AMS is well below the selected required uncertainty, an AST will be performed on the AMS once a year. If at a later time, the DFP (Designated Focal Point) agrees that the AST is not required on a yearly basis (considering the consistent performance of the AMS), the frequency will be modified accordingly.

Annex 4

EXPECTED PROJECT COSTS

Estimated costs of the main equipment that is required for the project implementation are presented in the table below.

Equipment	Estimated cost, Euro
Automatic Monitoring System (AMS) (equipment, installation, software, etc.)	120 000
Secondary catalyst for N_2O destruction	350 000