Projet Design Document (PDD)

This document must be completed without changing the format

SECTION A. General description of the project activity

A.1. Title of the project activity

GPN Grandpuits N_2O abatement project
Date: 19th January 2010
Version: 04

A.2. Description of the project activity (maximum one page)

The sole purpose of the proposed project activity is to reduce levels of N_2O emissions from the production of nitric acid at GPN's Grandpuits nitric acid plant at Grandpuits-Bailly-Carrois (Seine et Marne), France.

The nitric acid plant was designed by GPN. Commercial nitric acid production started in 1970. It is a 3.5 bar medium pressure plant with a daily design production capacity of 1,250[1] metric tonnes of HNO_3 (100% conc.) per day[2]. The plant's design campaign length is approx 360 days. Depending on whether or not the plant is shut down for maintenance purposes or exchange of the primary catalyst gauze, the plant can be operated for around 340 days per year resulting in a maximum possible annual production output of 425,000 $tHNO_3$. However, the realistic budgeted annual production for the coming years is somewhat lower, at 393,000 $tHNO_3$.

To produce nitric acid, ammonia (NH_3) is reacted with air over precious metal – normally a platinum-rhodium-palladium (Pt-Rh-Pd) alloy – catalyst gauze pack in the ammonia oxidation reactor of the nitric acid plant. The main product of this reaction is NO, which is metastable at the conditions present in the ammonia oxidation reactor. This NO is then further oxidised to form NO_2, which is later absorbed in water to produce HNO_3 – nitric acid. Simultaneously, undesired side reactions yield nitrous oxide (N_2O), nitrogen and water. N_2O is a potent greenhouse gas with a Global Warming Potential (GWP) of 310[3]. Without any effort to reduce N_2O emissions at the plant from the current levels, the plant would emit an average of 3.99 kgN_2O / $tHNO_3$[4], which means that the operation of the plant without any N_2O abatement technology installed could entail the emission of around 525,683 tCO_2e annually[5].

The project activity involves the installation of a secondary N_2O abatement technology: a pelleted catalyst that is installed inside the plant's 4 ammonia oxidation reactors, underneath

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[1] As specified in point 2, article 3.2.2 (p13) of the 'Arrêté Préfectoral 09 DAIDD IC 142', dated 04.06.2009

[2] All nitric acid quantities are provided in metric tonnes of 100% concentrated HNO_3, unless otherwise indicated.

[3] IPCC Second Assessment Report (1995); applicable according to UNFCCC-decision 2/CP.3, paragraph 3.

[4] Monthly average measurements of N_2O concentration in the stack during the period December 2007 to December 2008 show an average concentration equal to 3.99 $kgN_2O/tHNO_3$

[5]. This statement is based on the assumption of a maximum yearly production of 425,000 tHNO3 (1,250 t/day for 340 days / year).

the primary precious metal gauzes. With the limited bed-depth available for the secondary catalyst, it is expected that this technology will reduce a maximum of 70% of current N_2O emissions on average over its lifetime.

The N_2O abatement catalyst applied to the proposed project has been developed by Heraeus. This catalyst is installed in several other CDM projects around the world.

For monitoring the N_2O emission levels, GPN Grandpuits will install and operate an Automated Monitoring System in accordance with EU standards[6].

GPN Grandpuits adheres to ISO9001 and ISO14001 management standards[7] and will implement procedures for monitoring, regular calibrations and Quality Assurance and Quality Control (QA/QC) in line with the requirements of these standards.

A.3. Project participants

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
France (host)	GPN S.A.	No
Germany	N.serve Environmental Services GmbH (Germany)	No

This JI Project (Projet Domestique) will be developed as a party-verified activity in accordance with UNFCCC decision 9/CMP.1, paragraph 23 by the host country France.

A.4. Technical description of the project activity

A.4.1. Location of project activity

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A.4.1.1. Host party (ies)

France

A.4.1.2. Region

Region: North Central (Ile de France) Département: Seine-et-Marne

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[6] See sections B.7.2 and Annex 3 for detailed information.

[7] All quality management documents will be made available to the AIEs upon request.

A.4.1.3. Commune

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Grandpuits-Bailly-Carrois

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (one page maximum)

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GPN Usine de Grandpuits
BP12
77720
Mormant
France

The pictures below illustrate the location of the plant. In figure 1, the red pin indicates the location of the Grandpuits nitric acid plant.

Figure 1: Location of GPN Grandpuits plant

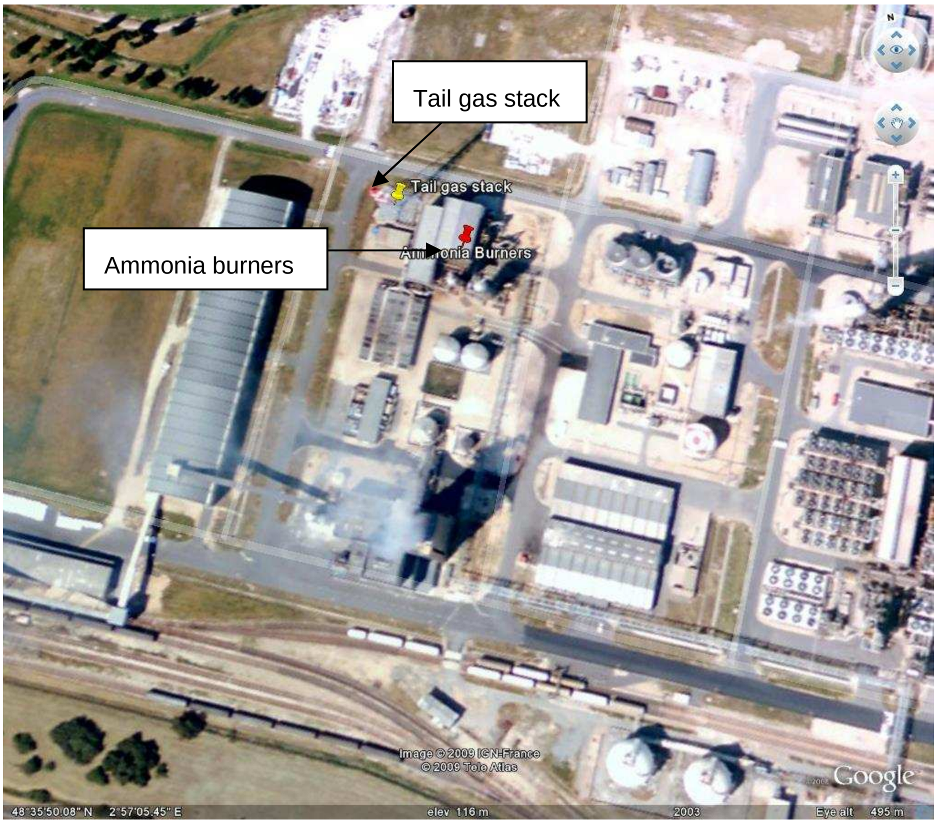

Figure 2: Close-up image of GPN Grandpuits plant

Coordinates:

Plant tail gas stack:	Lat:	48°35'52.82"N
	Long:	2°57'06.05"E
Ammonia burner:	Lat:	48°35'52.82"N
	Long:	2°57'06.05"E

A.4.2. Technology (ies) to be employed, measures, operations or actions to be undertaken within the framework of the project activity

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The main parts of the plant as currently set up are the 4 ammonia burners inside which the ammonia oxidation reaction takes place, the 1 absorption tower, where the gas mix from the burners is led through water in order to form nitric acid and 1 stack through which the off-gasses are vented into the atmosphere.

The precious metal gauze packs – i.e. the primary catalyst required for the formation of NO – will be supplied by Heraeus in Germany for the duration of the project. The project activity entails the installation of:

- N_2O abatement technology, which is installed in the baskets underneath the primary catalyst in the ammonia oxidation reactors; and
- Specialised monitoring equipment to be installed at the tail gas stack (detailed information on the AMS is contained in section B.7.2 and Annex 3).

Catalyst Technology

A number of N_2O abatement technologies have become commercially available in the past 3 years after several years of research, development and industrial testing. Since end of 2005, several CDM project activities employing various kinds of N_2O abatement catalysts have been registered with the CDM Executive Board. But these activities are obviously limited to plants located in developing nations.

The only national regulation limiting N_2O emissions in France is a compulsory limit applying to nitric acid production on French territory of $7kgN_2O/tHNO_3$ for all plants commissioned after February 1998[8]. However, due to lack of incentives for voluntary reductions before 2008[9] and the general absence of more ambitious legal limits on industrial N_2O emissions in nearly all the European Union member states, the vast majority of EU-based plant operators have so far not invested in N_2O abatement devices.

In 2007, discussions in France were already at an advanced stage regarding the reduction of N_2O emissions at nitric acid plants and the implementation of JI projects in France (Projets Domestiques). The rules and procedures for JI projects were already defined in March 2007 by the 'Arrêté du 2 mars 2007'[10] of the Ministère de l'Ecologie, de l'Energie, du Développement durable et de la Mer (MEEDDM). Therefore the potential opportunity to participate in a Projet Domestique now provides a real incentive for plants to install some form of N_2O abatement catalyst.

GPN Grandpuits has chosen to install a Heraeus secondary catalyst system, consisting of ceramic pellets coated with precious metal that are filled into the reactor. A total of 2,744kg of catalyst (686kg per burner) will be positioned below the standard precious metal gauze packs in the 4 ammonia burners.

A secondary catalyst reduces N_2O levels in the gas mix resulting from the primary ammonia oxidation reaction. A wide range of metals (e.g. Cu, Fe, Mn, Co and Ni) have shown to be of varied efficiency in N_2O abatement catalysts. The HR-SC abatement catalyst is made of ceramic pellets coated with precious metal, and its abatement efficiency has been shown to be up to 90% in the following reaction (depending on the individual plant specifications):

$$2\,N_2O \rightarrow 2N_2 + O_2$$

If operated properly, the secondary catalyst system may significantly reduce N_2O emissions for up to three years before the catalyst material needs to be replaced.

The abatement catalyst has been proven not to affect plant production levels[11] and does not contaminate the nitric acid produced[12]. No additional heat or other energy input is required,

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[8] See Article 27 of the « Arrêté Ministériel du 02/02/98 relatif aux prélèvements et à la consommation d'eau ainsi qu'aux émissions de toute nature des installations classées pour la protection de l'environnement »

[9] See decision 9/CMP.1, paragraph 5: "ERUs shall only be awarded for a Crediting Period after the beginning of 2008."

[10] Published on the internet under http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000430873&dateTexte=

[11] See the European IPPC Bureau publication „Integrated Pollution Prevention and Control; Reference Document on Best Available Techniques for the Manufacture of Large Volume Inorganic Chemicals – Ammonia, Acids and Fertilizers (August 2007), page 124 therein. This source states that NO yields for the ammonia oxidation reaction remain largely unchanged when operating secondary N_2O abatement catalysts.

[12] This has been proven in industrial testing in small scale reactors and commercial installations. General information on this question is contained in the European IPPC Bureau publication „Integrated Pollution Prevention and Control; Reference Document on Best Available Techniques for the Manufacture of Large Volume

because the temperature levels present inside the ammonia oxidation reactors suffice to ensure the catalyst's optimum abatement efficiency. There are no additional greenhouse gases or other emissions generated by the reactions at the N_2O abatement catalyst.

Basket modifications

Due to the additional secondary catalyst requirement, the existing support beams in every burner have had to be modified in order to create sufficient space within the reactor for the additional secondary catalyst and also to support the extra weight of this catalyst.

N_2O abatement catalyst installation

The secondary catalyst itself is installed during a routine plant shut-down and gauze change underneath the primary catalyst gauzes.

After the end of its useful life, the catalyst will be returned to Heraeus, where the precious metal will be recovered and the ceramic pellets will be disposed of according to EU regulations.

GPN Grandpuits nitric acid plant operates at a pressure of 3.5 bars inside the ammonia oxidation reactors. Through the introduction of the full batch of secondary catalyst into the ammonia reactor, a slight additional pressure drop (ΔP) is expected to occur. This ΔP may lead to a slight reduction in ammonia conversion efficiency and hence a very small reduction in nitric acid output. In practice however, this loss of production is unlikely to be significant.

Technology operation and safety issues

As mentioned before, the secondary abatement technology has been tested in several CDM projects and has proven to be a reliable and environmentally safe method of reducing N_2O.

Once installed, the catalyst and the Automated Monitoring System (AMS) will be operated, maintained and supervised by the employees of GPN Grandpuits according to European industry standards[13]. GPN is very confident that the effective operation of the catalyst technology, the operation of the monitoring system and the data collection, storage and processing can be managed in accordance with the Projet Domestique requirements. Adherence to the applicable standards will be ensured by thorough training sessions for the GPN employees involved.

A.4.3. Estimated quantity of emissions reductions during the crediting period

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Table 1. Estimation of the emissions reductions to be issued to the project activity (calculated in section B), relative to the Benchmark emissions factor (see information directly below table 1 for an explanation of the Benchmark emissions factor). **Please note that all figures in the calculation tables have been rounded to the nearest tonne of CO2e. In view of the fact**

Inorganic Chemicals – Ammonia, Acids and Fertilizers (August 2007), page 124 therein (available for downloading under http://eippcb.jrc.ec.europa.eu/pages/FActivities.htm)

[13] See section B.7.2 below.

that the figures link directly to a detailed excel spreadsheet, the final total may therefore not accord completely with the preceding figures.

Year	**Estimation of annual emissions reductions in tonnes of CO_2e**
2010	92,103
2011	122,805
2012	51,534
Estimation of total emissions reductions over the crediting period (tCO2e)	**266,442**

* Due to the likely inclusion of N_2O emissions emanating from nitric acid production into the EU ETS from 1st January 2013 onwards, the project may not be eligible to earn ERUs after that time, or continuing the project under the JI may not be economically viable.

The French Designated Focal Point (Le Ministère de l'Écologie, de l'Énergie, du Développement Durable et de la Mer (MEEDDM)) has ruled that a universal 'Benchmark Emissions Factor' (EF_{BM}) should be applied for all nitric acid plants eligible to undertake Projets Domestiques, regardless of their size, their technical characteristics and their past and present emissions levels.

The reference case benchmark emissions factors were specified following an official meeting between representatives of the French nitric acid industry and the French government on the 10th April 2009 and are to be applied as follows:

2009	**2010**	**2011**	**2012**
2.5kg	2.5kg	2.5kg	1.85kg

Table 2: Applicable projet domestique benchmark emission factors (kg $N_2O/tHNO_3$)

If any of the above values are subsequently revised during the course of the project activity, the project proponents explicitly reserve the right to apply such new benchmark values for the respective project periods

The French methodology for Projets Domestiques "Catalytic reduction of N_2O at nitric acid plants" also states that in the case where "the specific emissions factor fixed by a national or local regulation (arrêté préfectoral) is lower than the fixed benchmark value....the specific regulatory emissions factor shall serve as the basis for the calculation of ERUs".

On 4th June 2009, the local DRIRE (Directions Régionales de l'Industrie de la Recherche et de l'Environnement) introduced a plant-specific 'arrêté préféctoral', which will limit N_2O emissions at the GPN Grandpuits plant to 4kg $N_2O/tHNO_3$ from the start of the next production campaign (December 2009) onwards[14].

Thus, since the regulatory N_2O emissions limit to be applied at Grandpuits will be higher than the applicable benchmark values, these values specified above shall serve as the basis for calculating the ERUs to be awarded for the project until the end of 2012. The project shall

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[14] Column 1, article 3.2.5, 'Arrêté Préfectoral 09 DAIDD IC 142', dated 04.06.2009

therefore receive ERUs for the difference between the applicable benchmark emissions factors and the emission levels of the project activity.

A.5. Approval of the project by the relevant parties

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Following the Determination of the project by an Accredited Independent Entity, the project participants will submit a full project dossier (including the PDD and preliminary Determination report) in order to request a Letter of Approval from the MEEDDM. The procedure for assessment of the project documentation by the MEEDDM takes two months from the date of submission of the project dossier, at the end of which a final decision regarding approval of the Projet Domestique will be taken. In the case of a positive decision by the government, the project participants will receive an official Letter of Approval from the MEEDDM.

The project activity will only become eligible to receive ERUs on receipt of the official government LoA, or at the latest two months after submission of the Project Dossier applying for a LoA. For Grandpuits, the final approval could be expected by the end of March 2010 and therefore the crediting period of the project is likely to start at the beginning of April 2010.

SECTION B. Reference case scenario and monitoring methodology

B.1. Title of the reference case and monitoring methodology to be applied to the project activity

« Methodology for Projet Domestiques: Catalytic reduction of N_2O at nitric acid plants »

B.2. Justification of the choice of methodology and reasons for which it is applicable to the project activity

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Regulatory framework

The regulatory framework for implementing JI projects in France is influenced by several acts of law. The fundamental framework is provided by the Kyoto Protocol to the United Nations' Framework Convention on Climate Change ("UNFCCC") and subsequent decisions by UNFCCC-entities, most importantly the decisions of the Conference of the UNFCCC Parties serving as the Meeting of Parties to the Kyoto Protocol ("CMP") and the Joint Implementation Supervisory Committee ("JI SC").

In addition, there is the European Union legislation adapting the Kyoto JI framework for application in its member states, such as the Emissions Trading Directive[15], the Linking Directive[16] and various JI relevant decisions by EU bodies[17]. Besides acts of law of direct

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[15] 2003/87/EC, published on the internet under http://ec.europa.eu/environment/climat/emission/implementation_en.htm

[16] 2004/101/EC, published on the internet under http://ec.europa.eu/environment/climat/emission/implementation_en.htm

relevance, there also are Directives that have an indirect influence on JI implementation such as the IPPC Directive[18].

EU Directives do not entail direct consequences on private entities located in the EU member states. In order to be enforceable on member state level, they generally have to be transformed into national legislation by the respective member state. These national transformation acts, as well as other national legislation, are the third layer of the regulatory framework relevant for JI project implementation. In France, the most relevant pieces of legislation are the 'Décret n° 2006-622 du 29 mai 2 006'[19] for the application of articles L. 229-20 to L. 229-24 of the 'code de l'environnement', and the 'Arrêté du 2 mars 2007'[20] of the 'Ministère de l'écologie et du développement durable'.

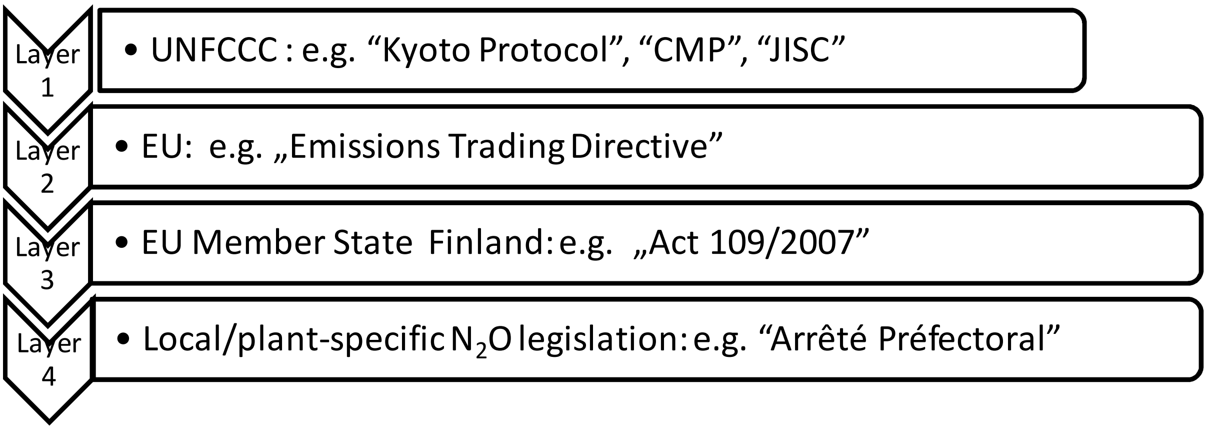

Illustration: Four layers of jurisdiction relevant for the implementation and subsequent operation of N_2O nitric acid JI projects in France

Applicability of Methodology «Catalytic reduction of N_2O at nitric acid plants»

The methodology for the reduction of N_2O emissions at nitric acid plants in France ("Catalytic reduction of N_2O at nitric acid plants") was approved by the MEEDDM in July 2009 and is applicable to project activities aiming to install either secondary or tertiary N_2O abatement technology. The GPN Grandpuits plant consists of four ammonia burners feeding into two absorption towers, the off-gasses of which are emitted through one stack. The secondary N_2O catalyst system is inserted in the ammonia reactors directly underneath the primary catalyst gauzes. This corresponds to the defined scope of the methodology.

Also, the project activity does not lead to the shut-down of any N_2O abatement devices already installed. Before the start of the project, GPN had not installed any form of technology for the specific reduction of N_2O. Moreover, the project activity will not increase NO_X emissions. The secondary catalyst technology installed has no effect on NO_X emission

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[17] Such as the Double Counting decision 2006/780/EC, published on the internet under http://ec.europa.eu/environment/climat/emission/pdf/l_31620061116en00120017.pdf

[18] 2008/1/EC, published on the internet under http://ec.europa.eu/environment/air/pollutants/stationary/ippc/index.htm

[19] Published on the internet under http://www.legifrance.gouv.fr/affichTexteArticle.do;jsessionid=85B1492FA603258E5FA3B94465CA21C1.tpdjo07v_2?cidTexte=JORFTEXT000000268218&idArticle=LEGIARTI000006251745&dateTexte=20060530&categorieLien=cid

[20] Published on the internet under http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000430873&dateTexte=

levels[21]. In addition, the regular and compulsory NO_X tests conducted by GPN under the supervision of the responsible local environmental authority would reveal any changes in NO_X emission levels.

B.3. Description of GHG sources included in the project boundary

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The project boundary entails all parts of the nitric acid plant in so far as they are needed for the nitric acid production process itself. With regard to the process sequence, the project boundary begins at the inlets to the ammonia burners and ends at the tail gas stack. Any form of NO_X-abatement device shall also be regarded as being within the project boundary.

The flow chart below provides an overview on the plant's process design:

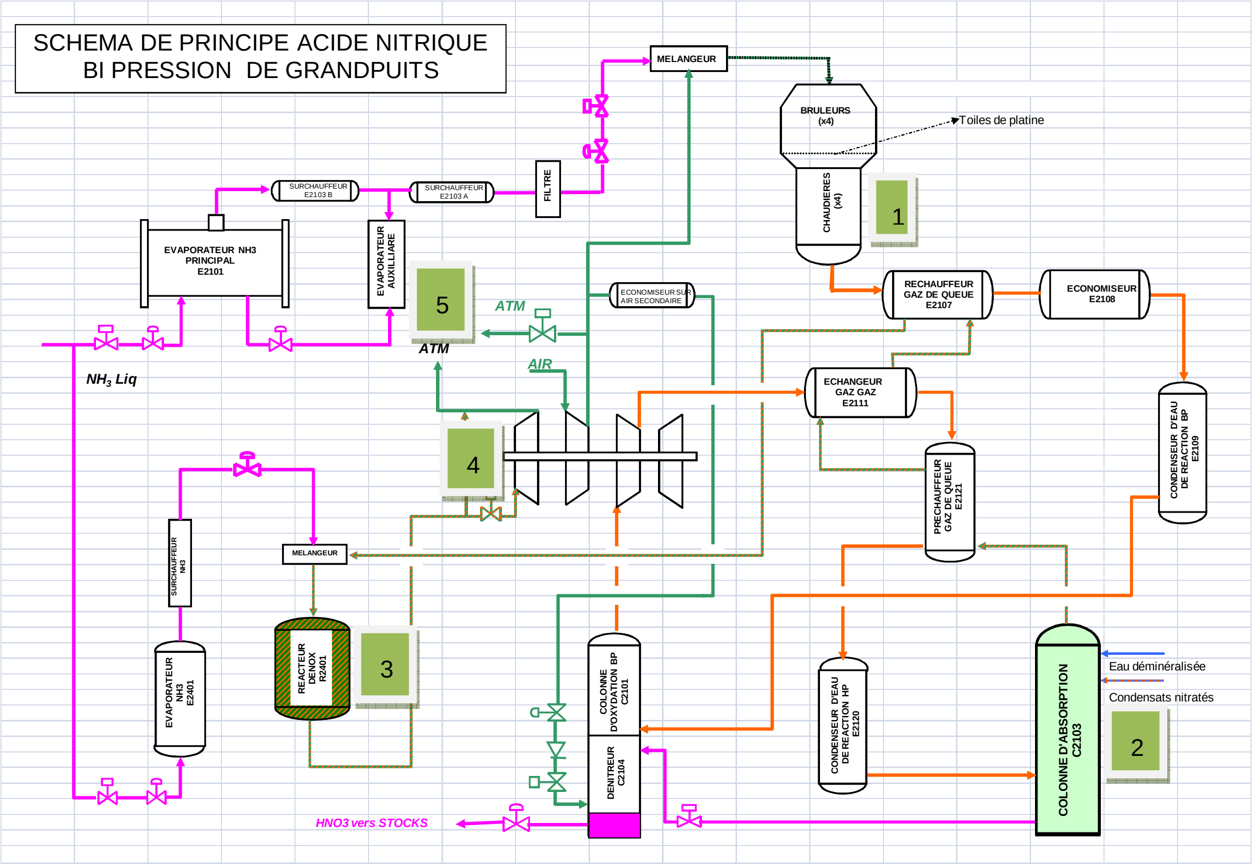

Illustration: Flow chart for the GPN Grandpuits nitric acid plant.

1 = 4 Ammonia oxidation reactors

2 = Absorption column

3 = SCR De-NOx reactor

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[21] See the European IPPC Bureau publication „Integrated Pollution Prevention and Control; Reference Document on Best Available Techniques for the Manufacture of Large Volume Inorganic Chemicals – Ammonia, Acids and Fertilizers (August 2007), page 124 f. therein. This source states that NO yields for the ammonia oxidation reaction remain unchanged when operating secondary N_2O abatement catalysts.

4 = Tail gas turbine

5 = Tail gas stack

	Source	**Gas**	**Included / excluded**	**Justification / Explanation**
Reference scenario	Benchmark emissions level	CO_2	Excluded	N_2O abatement project does not lead to any CO_2 or CH_4 emissions
		CH_4	Excluded	
		N_2O	Included	
Project activity	Nitric acid plant (burner inlet to stack)	CO_2	Excluded	N_2O abatement project does not lead to any CO_2 or CH_4 emissions
		CH_4	Excluded	
		N_2O	Included	
	Leakage emissions	CO_2	Excluded	No Leakage Emissions are expected
		CH_4	Excluded	
		N_2O	Excluded	

Table 3. Sources and gases included in the project boundary

B.4. Identification and description of the reference case scenario (Business as usual scenario)

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The selection of the business as usual scenario involves the identification of all possible reference case scenarios and the elimination of those that are not viable.

This analysis is carried out in three steps:

Step 1. Identify the reference case scenarios that are technically feasible within the framework of the project activity:

The reference scenario alternatives should include all possible options that are technically feasible to handle N_2O emissions. The principally debatable options are:

a) Continuation of the S*tatus Quo*. The continuation of the current situation, where:
   - i) there is no N_2O destruction technology installed
   - ii) an N_2O abatement catalyst has already been installed for a preliminary technical trial, but the catalyst would either be removed at the end of this trial campaign; or
   - iii) only sufficient catalyst is installed to ensure compliance with any applicable legal N_2O regulations.

b) Alternative uses of N_2O, such as:
   - Recycling of N_2O for feedstock
   - External use of N_2O

c) Installation of a Non-Selective Catalytic Reduction unit (NSCR)

d) Implementation of a primary, secondary or tertiary N_2O destruction technology in the absence of the registration of the project activity as a Projet Domestique.

Assessment of the present situation, the "Status Quo"

GPN is currently not subject to any regulations or requirements regarding the limitation of N_2O emissions at its Grandpuits nitric acid plant.

GPN Grandpuits was however issued on 4th June 2009 with a plant-specific Arrêté Préféctoral by the local DRIRE (Directions Régionales de l'Industrie de la Recherche et de l'Environnement), which will impose a future maximum N_2O limit of 4kg $N_2O/tHNO_3$ at the plant from the beginning of the next production campaign (December 2009).

The new 4kg regulatory limit set in the Arrete Prefectoral is not expressed as an annual average, but rather a maximum permitted value. Given that the plant's *average* emissions levels without the installation of the secondary catalyst would be around 3.99kg $N_2O/tHNO_3$ throughout a campaign[22], in order to ensure constant compliance with the new limit, GPN will be forced to install a certain quantity of secondary catalyst.

However, taking into account the expensive cost of secondary catalyst material, the necessary basket modifications due to the very limited bed depth available in the reactors, and the potential technical problems that could arise at any time as a result of having a more significant layer of secondary catalyst installed inside the burner (pressure drop, production loss, gas bypass etc), the plant would install only just enough catalyst to comply with the regulatory requirement of 4kg $N_2O/tHNO_3$, but no more.

The reference case 'business as usual' scenario would therefore be for GPN Grandpuits to install a small amount of secondary catalyst in order to ensure compliance with the upcoming regulatory N_2O emissions limit. However, GPN would not install any more secondary catalyst than is absolutely necessary for compliance purposes.

Alternative uses of N_2O

The use of N_2O as a feedstock for the production of nitric acid is technically not feasible, because it is not possible to produce nitric acid from N_2O at the quantities found in the tail gas of nitric acid plants.

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[22] According to monthly average emissions data recorded from Dec 07 to Dec 08 with Heraeus FTC primary catalyst. The Johnson Matthey primary catalyst data is not relevant for the purposes of estimating the most likely emissions in the absence of the secondary catalyst, since the JM primary catalyst was only used for one test campaign and it is the Heraeus primary catalyst that will be used for the duration of the project. Therefore it is the emissions data collected with the Heraeus primary catalyst that should be used as a basis for estimating the average future emissions levels.

The use of nitric acid process N_2O for external purposes is not practised anywhere in the world, as it is technically and economically unfeasible. The quantity of gas to be used as a source is enormous compared to the amount of nitrous oxide that could be recovered. The average N_2O concentration in the tail gas of the Grandpuits plant during standard operation without any secondary abatement catalyst would be just over 600ppmv[23], which is considered far too low to economically recover and separate N_2O from the tail gas.

Therefore, the baseline scenarios under b) are excluded from further assessment.

Installation of NCSR

The EFMA BAT reference document explains that an NSCR functions by injecting hydrogen, natural gas or hydrocarbons over a precious metal based catalyst, leading to high investment and operational costs. The use of hydrocarbons as a reducing agent also results in emissions of carbon monoxide, CO_2 and unburned hydrocarbons. For most reducing agents the tail gas also has to be pre-heated to a temperature of around 500℃ in order for the catalyst to function effectively.

Since GPN Grandpuits already has a very efficient SCR de-NO_X catalyst device installed, there would be no point in also installing NSCR, even if this technology were to be considered an alternative option[24].

Implementation of primary, secondary and tertiary technologies

The primary catalyst composition is the most significant factor in determining nitric acid production efficiency and is always carefully calculated to ensure a maximum production of HNO_3 at a minimum cost: it is not an N_2O reduction technology.

Without installing a significant quantity of one of the already widely-tested and well-proven secondary or tertiary catalyst technologies (whose specific purpose is the significant reduction of N_2O), it would not be possible for GPN to reduce its N_2O levels to a point where the campaign average would be below the benchmark value of 2.5kg.

Step 2. Eliminate the reference scenario alternatives that do not comply with national or local regulations:

For the sake of clarification, the national N_2O regulation of 7 $kgN_2O/tHNO_3$ is not relevant in the context of this project, since this only applies to plants that were commissioned after 1998 (while Grandpuits has been in operation since 1970).

On 4th June 2009, the local DRIRE introduced a plant-specific 'Arrêté préféctoral', which will limit N_2O emissions at the Grandpuits plant to a maximum of 4kg $N_2O/tHNO_3$ from the start of the next production campaign in December 2009[25].

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[23] This value is derived from the monthly average N_2O emissions readings taken at Grandpuits from December 2007 to December 2008

[24] For other disadvantages of NSCR technology see an EFMA-booklet published in the internet under http://www.efma.org/EPUB/easnet.dll/ExecReq/Page?eas:template_im=000BC2&eas:dat_im=000EAE (page 18 therein).

This level does not represent the maximum N_2O reduction achievable. Using a greater quantity of secondary catalyst technology, N_2O emissions could theoretically be lowered significantly below the stated value. However, to minimise the costs and potential impact on nitric acid production (as detailed above in step B.4), the reference case scenario would be for GPN to install only as much volume/weight of N_2O abatement catalyst as is necessary to ensure compliance with the applicable 'arrêté préféctoral'.

NO_X-emissions are also regulated by the 'Arrêté Préféctoral' issued by the local DRIRE for the GPN Grandpuits plant on 4th June 2009. This regulation limits NOx emissions at the plant to 1.3kg/$tHNO_3$[26]. The plant is comfortably in compliance with these requirements, since its average NOx emissions in 2008 were 0.805kg NOx/$tHNO_3$[27].

GPN Grandpuits NO_X emissions will remain constant and in compliance with the regulatory limit also after the commencement of the Projet Domestique. This is safeguarded by the fact that NO_X emissions are regularly reported to the responsible local environmental authority[28].

Accordingly, the NSCR scenario alternative could be triggered by NO_X regulation. From this perspective, GPN Grandpuits could be forced to reduce N_2O in a reference scenario if NO_X regulation forced the plant operators to install NSCR technology.

However, the installation of a NSCR de-NO_X catalyst unit is uneconomic, because GPN Grandpuits is already in compliance with the prevailing NO_X regulations, thanks to its existing SCR unit. If even lower NO_X levels were to be introduced, the most economical option would be to upgrade the existing SCR NO_X abatement unit already installed at the plant. However, Grandpuits is currently achieving NO_X-emission levels significantly below the applicable limit so that such a scenario would be extremely unlikely.

In consequence, no further scenarios can be excluded at this stage, since all the remaining options would be in compliance with all applicable laws and regulatory requirements.

Step 3. Eliminate the reference scenario alternatives that would face prohibitive barriers (barrier analysis):

On the basis of the remaining technically feasible alternatives that comply with local and national regulations, the project proponent must establish a complete list of the barriers that would prevent the implementation of the various alternatives in the absence of the Projet Domestique.

The identified barriers are:

a) Investment barriers;

b) Technological barriers, including :

  - Technical and operational risks of the alternative scenarios;

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[25] Column 1, article 3.2.5, 'Arrêté Préfectoral 09 DAIDD IC 142', dated 04.06.2009

[26] Column 1, article 3.2.5, 'Arrêté Préfectoral 09 DAIDD IC 142', dated 04.06.2009

[27] Average NOx emissions in 2008 (January to December), based on monthly averages.

[28] DRIRE: Directions Régionales de l'Industrie de la Recherche et de l'Environnement

  - Technical efficiency of the alternatives (i.e. destruction of N_2O, abatement efficiency);
  - Lack of qualified personnel;
  - Lack of infrastructure for implementing the technology;

c) Common practice barriers, including :

  - Technology with which project developers are not familiar;
  - There is no other similar project in operation in the relevant geographical area ;

Investment barriers

The investment barrier analysis asks which of the remaining scenario alternatives is likely to be prevented by the costs associated with it becoming reality. The assumption is that these scenarios would be unlikely to be the Business as Usual scenario.

None of the N_2O destruction technology options (including NSCR) are expected to generate any significant financial or economic benefits other than JI related income. The N_2O destruction technology options do not create any marketable products or by-products. However, any operator willing to install and thereafter operate such technology generally faces significant investment and additional operating costs.

Therefore, plant operators would face significant investment requirements if they decided to install N_2O abatement (including NSCR) technology. See section B.4 step 2 for additional information on investment barriers facing NSCR technology. Since catalyst material and basket modifications are expensive and potential operational problems may occur with increased catalyst loads, abating emissions to a level beyond that required for compliance with any legal N_2O limits is only made economically viable by means of Projet Domestique revenues.

However, while any reference scenario alternatives that include the implementation of N_2O abatement catalysts would entail considerable investment barriers, the application of a mandatory ‘arrêté préféctoral’ by the local DRIRE from December 2009 onwards means that the “**Status quo**” should not be interpreted to face such barriers. This is because the requirement to invest in some form of N_2O abatement technology from December 2009 onwards is not connected to the proposed JI project activity.

For the purpose of this PDD, the “Status Quo” scenario is considered not to face any significant investment barriers.

Technological barriers

All of the available N_2O abatement technologies have to be integrated in the nitric acid plant. Secondary abatement technologies are installed inside the ammonia oxidation reactor where they may, if not correctly designed and installed, interfere with the nitric acid production process by causing a deterioration of product quality or a loss of production output. Tertiary measures require the installation of a complete reactor between the absorption column and the stack, as well as a re-heating system, which may cause significant downtime of the plant during construction and commissioning[29].

The greater the bed depth of catalyst installed inside the burner, the more likely it will be that the plant encounters problems associated with pressure drop. This may affect the gas flow through the burner, potentially lowering nitric acid production yields. Additionally, the heavier the load of catalyst, the stronger must be its supporting containment structure and the more technical burner modifications will be needed to accommodate the increased load.

It is therefore unlikely that any plant operator would install such technologies on a voluntary basis without the incentive of any regulatory requirements (emissions caps) or financial benefits (such as revenues from the sale of ERUs).

However, due to the application of a mandatory 'arrêté préféctoral' by the local DRIRE from December 2009 onwards, the option of *not* installing some form of N_2O abatement device cannot be considered if production is to be continued at Grandpuits. Consequently, the scenario alternative "Status quo" should be regarded as not facing any technological barriers.

Common practice barriers

This test reconfirms the previous assessments: If the steps taken so far have led to the conclusion that one or more reference scenario alternatives meet investment related or technological barriers, these scenarios should be excluded. Of course, similar plants that gain ERU revenues by participating in the JI, and can thus overcome the identified barriers by the additional financial means available, are not to be taken into account.

So far, secondary catalyst technology has only been operated in some European countries on an industrial trial basis. Researching this technology made sense due to the prospective revenues obtainable under the Kyoto Protocol's Clean Development Mechanism (CDM) by employing it in nitric acid plants located in developing nations on a voluntary basis. Also, it is expected that N_2O emissions from nitric acid production may be included in the European Union Emissions Trading Scheme ("EU ETS")[30] or regulated otherwise. Both aspects theoretically could provide some incentive for developing N_2O abatement technology.

However, since secondary catalyst technology is now being employed successfully in many CDM and JI projects worldwide, the industrial research and development trials have now all been completed and plant operators are no longer willing to incur the costs associated with the continued operation of such technology. In the case where plants are subject to N_2O regulations and the installation of some catalyst is therefore unavoidable, these plant operators would only be willing to incur costs associated with the operation of such technology in order to comply with these regulations – they would not be willing to incur the

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[29] Also see footnote 24 for further information and reference on NSCR technology.

[30] On 23rd January 2008, the EU Commission published a communication on its post-2013 climate change strategy (see http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2005:0035:FIN:EN:PDF), which announces the determination to expand the EU ETS beyond its present scope, especially mentioning the inclusion of non-CO_2 gasses into the system. This development is no news to the industry, because responding to Article 30 of the EU ETS Directive 2003/87/EC, the Commission had submitted a report to the European Parliament and the Council considering the inclusion of non-CO_2 GHGs into the EU ETS already in November 2006.
See the EU homepage under http://ec.europa.eu/environment/climat/emission/pdf/com2006_676final_en.pdf for this report which expressly considers extending the EU ETS into N_2O emissions (see page 6 therein).

additional costs required to increase catalyst quantities and achieve the maximum abatement efficiency.

Even for the French nitric acid producers for whom mandatory local N_2O limits are applicable, the only incentive remaining to achieve emissions reductions beyond those required by law is to take advantage of the incentives available under the Kyoto Protocol's Joint Implementation ("JI") mechanism. While this option has in principle been available since the beginning of 2008, EU member states took some time to develop a coherent policy approach on whether or not to allow JI participation in their respective territories, and if so, under which conditions.

The second argument raised above regarding the inclusion of nitric acid N_2O emissions in the EU ETS is not likely to become relevant for France until January 2013. On 23rd January 2008 the EU Commission issued a proposal[31] upon reviewing the EU ETS that suggests that nitric acid N_2O should be covered in the scheme's third trading period, commencing in 2013. While some EU member states have chosen to 'opt-in' their nitric acid sector into the EU ETS,[32] as already mentioned above, such a decision is extremely unlikely for France after the government has decided to allow JI participation (Projet Domestique). In reaction to this decision, nitric acid producers in France are starting to employ N_2O abatement technology in order to participate in the JI.

Such JI projects are currently being developed across the EU in Poland, Lithuania, Hungary, Bulgaria, France, Finland and Germany.

Conclusion

The only reference scenario alternative that has not been eliminated by this stage, is not prevented by any one of the barriers and is in full compliance with the prevailing laws and regulations in France is the continuation of the current situation "Status Quo", where just enough secondary N_2O reduction catalyst will be installed in order to ensure compliance with the plant-specific N_2O regulatory limit of 4kg $N_2O/tHNO_3$. Therefore, this is identified as the applicable reference scenario for the proposed project activity.

All other alternatives are eliminated.

In case of a change in environmental legislation (i.e. the introduction of more stringent NO_X- or N_2O-regulations) that could lead to a change in the results of this assessment, the above procedures shall be repeated.

B.5. Description of how the emissions reductions achieved as a result of the project activity are greater than those that would be achieved in the absence of the Projet Domestique (evaluation and demonstration of additionality)

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In order to demonstrate that the project is additional to business as usual, (i.e that the results of the project in terms of N_2O emissions are different to those of the baseline scenario), the project proponent must show a step-by-step assessment, in accordance with Annex 3 of the

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[31] See footnote 30

[32] Norway, the Netherlands, Austria and Italy

“Arrêté du 2 Mars 2007” and described in the methodology “Catalytic reduction of N_2O at nitric acid plants”

Identification of realistic alternative scenarios

The first step consists of identifying the realistic alternatives to the proposed project. The project proponent must summarise the different options that remain available to him after completion of the baseline scenario selection analysis in Section B.4 above:

- Implementation of the project activity

  The installation of the maximum quantity of secondary N_2O abatement catalyst. The burners will be modified and the containment systems filled to their maximum capacity to try and achieve the greatest possible reduction of N_2O emissions.

- The implementation of alternative investments that result in a comparable production of goods or a comparable provision of services (if still applicable following completion of the baseline scenario selection analysis in Section B.4 above)

  This section is not applicable, since all other alternative investments have been eliminated in section B.4 above.

- Continuation of the situation prior to the implementation of the proposed project activity

  Operation of the plant with N_2O abatement catalyst only partially installed to just achieve compliance with the plant-specific N_2O regulatory limit of 4kg $N_2O/tHNO_3$.

The proponent must then establish that the project activity could not be undertaken:

- Either because the economic incentives at the time of submission of the project dossier are insufficient to guarantee a return on investment as high as that resulting from the alternative investments (Step 2 of section 3.2 of the methodology “Catalytic reduction of N_2O at nitric acid plants”) ;
- Or because only the receipt of Emission Reduction Units (ERUs) would allow the proponent to overcome the barriers that prevent the necessary investments being undertaken (step 3 of 3.2 of the methodology “Catalytic reduction of N_2O at nitric acid plants”).

  The project proponent may chose to complete either Step 2 or Step 3.

The project participants have chosen to complete step 3 of section 3.2 of the methodology “Catalytic reduction of N_2O at nitric acid plants” in order to demonstrate the project’s additionality, since only the revenues from the sale of ERUs would encourage the implementation of the project activity. Step 2 of section 3.2 of the methodology “Catalytic reduction of N_2O at nitric acid plants” is therefore not applicable.

Barrier analysis: Step 3 of Section 3.2 of the methodology “Catalytic reduction of N_2O at nitric acid plants”)

The barrier analysis in this section of the addtionality discussions is limited to a comparison of the identified Business as Usual scenario with the intended project activity. In the case where the proponents choose not to undertake Step 2 of section 3.2 of the methodology "Catalytic reduction of N_2O at nitric acid plants", they must complete a full and documented analysis of all types of barriers, demonstrating that they limit or prevent to a large extent the implementation of the project activity, notably ;

- Investment barriers :

The proposed project activity aims to install and operate a full batch of secondary catalyst technology at the plant throughout the crediting period. In order to assess the project emissions, an Automated Monitoring System (AMS) has to be installed and operated. In addition to the increased investment for secondary catalyst to achieve maximum abatement efficiency and the investment for additional necessary burner modifications, GPN Grandpuits employees and management will have a significant additional work load to cope with in order to initiate the project activity and maintain it for the project's lifetime. Required training for AMS operation has to be undertaken by the responsible staff, and AMS calibration and other Projet Domestique-related audits have to be arranged, facilitated and paid for.

A JI project of this type entails significant investment requirements. See table 1 in Annex 4 for full details of these investment requirements.

As previously assessed, GPN has no need to make any further investment to decrease its N_2O emissions beyond the 4kg $N_2O/tHNO_3$ limit specified by the plant-specific 'arrêté préféctoral'. Surplus emission reductions beyond this regulatory limit through installation of an increased catalyst load would be avoided in order to avoid extra costs.

None of the N_2O destruction technology options (including NSCR) are expected to generate any significant financial or economic benefits other than JI related income. Stage 2 in section 4 of the methodology "Catalytic reduction of N_2O in nitric acid plants" states "in the particular case of nitric acid plants, the N_2O tax[33] does not provide any incentive for the project participants to install N_2O reduction technology and does therefore not need to be considered in the financial assessment".

Only the revenues from ERU sales would therefore be sufficient to pay back the investment costs of the project activity. The registration of the project activity as a Projet Domestique is therefore the decisive factor for the realisation of the proposed project activity.

- Technological barriers:

The greater the bed depth of catalyst installed inside the ammonia burners, the more likely it will be that the plant will encounter problems associated with pressure drop. This may affect the gas flow through the burner, potentially lowering nitric acid production yields. Additionally, the heavier the load of catalyst, the stronger must be its supporting containment structure and the more technical burner modifications will be needed to accommodate the increased load.

Revenues from the sale of ERUs provide the only incentive for the plant managers to confront this possible technical risk and operate the additional N_2O abatement catalyst.

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[33] Payable in accordance with article 45 of the 'Loi de Finances 1999' and article 266 nonies of the 'Code des Douanes'

- Common practice barriers :

Market studies (e.g. by EFMA, EU IPPC, US EPA, IPCC) show that N_2O abatement technologies have not been widely applied in the nitric acid industry even in Annex 1 countries, apart from in occasional industrial testing programmes. The main reason for this is a lack of regulation / incentive to reduce N_2O emissions.

The research and development work done so far has been driven by a general expectation that industrialised countries – especially the EU, USA, Japan and Canada – may eventually introduce N_2O emission caps. EU legislation initiating such a limit is under way already and will probably be introduced in the near future[34].

Since secondary catalyst technology is now being employed successfully in many CDM and JI projects worldwide, the industrial research and development trials have now all been completed.

The proposed project activity is not common practice. With the exception of other French nitric acid plants that are also beginning to implement N_2O abatement technologies as project activities under the Projet Domestique, the common practice in the country is to operate such facilities without any N_2O abatement technology. Therefore, the analysis of the common industrial practice indicates that the proposed project activity is additional to the reference scenario.

Conclusion:

GPN currently has no need to make any further investment to decrease its N_2O emissions beyond the 4kg $N_2O/tHNO_3$ limit specified by the applicable plant-specific ‘arrêté préféctoral’. Without the sale of the ERUs generated by the project activity there would be no incentive to justify the additional cost and technical risks associated with the implementation of the project activity. The project activity would not take place without the revenues from the sale of ERUs and therefore Projet Domestique registration is the decisive factor for the realisation of the proposed project activity.

The proposed Projet Domestique activity is additional, since it passes all the steps of the Additionality assessment.

B.6. Emission Reductions

B.6.1. Explanation of methodological choices

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Estimation of Verification Period specific project emissions

The project emission factor is assessed based on measurements of N_2O concentration in the stack gas ($NCSG_n$) and gas volume flow in the stack (VSG_n) conducted throughout any period of time for which the project proponents decide to undertake a Verification (the

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[34] See footnote 30 for detailed information.

"Verification Period"). Project proponents are free to decide what period of time they would like to define as a Verification Period as long as the following pre-requisites are met:

- The first Verification Period commences with the crediting period starting date.
- Any Verification Period after the first will start at the termination date of the previous Verification Period.
- No Verification Period may exceed the crediting period ending date.

Over the duration of the project activity, N_2O concentration and gas volume flow in the stack of the nitric acid plant, as well as the quantity of nitric acid produced by the plant, will be measured continuously and a **Project Emission Factor (EF_n)** – given as $kgN_2O/tHNO_3$ – can be established at any given time for any period of time.

Higher N_2O emissions during the project's lifetime will lead to a reduced amount of ERUs issued. For this reason the methodology "Catalytic reduction of N2O at nitric acid plants", contrary to the CDM methodology AM0034, has not provided measures against any abusive practices. Project operators will be sufficiently incentivised to run their plants at emission levels as low as possible in order not to lose ERU-revenues. In case a plant is emitting more N_2O than the Benchmark Emissions Factor, no additional environmental consequences are to be feared, as the only effect from this would be that the project activity will not generate any ERUs during such times[35] that will become available to carbon markets.

For these reasons, it is not relevant for which period ERUs are claimed.

Measuring of N_2O data sets for the calculation of project emissions

Throughout the project's crediting period, N_2O concentration ($NCSG_n$) and volume flow in the stack gas (VSG_n) are to be monitored. The monitoring system provides separate hourly average values for $NCSG_n$ and VSG_n based on continuous readings. These N_2O data sets (consisting of $NCSG_n$ and VSG_n average values for each operating hour) can be identified by means of a unique time / date key indicating when exactly the values were observed.

During the crediting period, the following additional data has to be monitored:

- The operating hours (OH_n) and the nitric acid production output (NAP_n) are required for calculating the project emissions factor.

Because the reference Benchmark Value (unlike the Emissions Factor Baseline EF_{BL} in AM0034) is not determined based on certain plant operating parameters, there is no need to monitor those plant operating parameters and establish the comparability of the two data sets by adjusting the EF_{BM} for each Verification Period.

Measurement of NAP

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[35] For the avoidance of doubt, ERU reductions for production periods with emission levels above the applicable Benchmark Emissions Factor DO NOT apply!

The NAP value (tonnes of HNO_3 produced at 100% concentration) to be used in the calculation of the project emissions factor is determined using the following procedure:

1) An electromagnetic flow meter measures the gas volume flow in m_3/hr
2) A densimeter measures the density and temperature and automatically calculates the concentration of the acid
3) The volume flow is converted automatically into mass flow (t/hr) by multiplication with the measured density
4) The HNO_3 produced at 100% concentration is calculated automatically in the DCS by multiplying the mass flow by the concentration

The acid concentration shown by the densimeter is checked twice per shift by an operator, using the recorded density and temperature readings. A second cross-check is carried out once per week by a laboratory sample analysis.

Missing data

During downtime of the AMS or other interruption of measurement during part of one hour, the hourly average will be calculated based on the remaining values for the rest of the hour in question. If these remaining values account for less than 50% of the hourly data for one or more parameters, then this hour must be eliminated from the calculation. Each time it is impossible to calculate an hour of valid data, substitute values will be defined in accordance with the following rules:

i. *Concentrations*

In the case where it is impossible to obtain an hour of valid data for a parameter whose concentration is directly measured (GHG, O_2 etc), a substitute value (C*subst) must be calculated for the hour in question, as follows:

C*subst = C + σC_

where:

C: arithmetic mean of the concentration of the relevant parameter

σC_: Best estimate of the standard deviation of the concentration of the relevant parameter

The arithmetic mean and the standard deviation are calculated at the end of the relevant verification period on the basis of all emissions data measured during that period.

The calculation of the arithmetic mean and the standard deviation must be presented to the verifier.

ii. *Other parameters*

In the case where it is impossible to obtain an hour of valid data for a parameter whose concentration is not directly measured, substitute values must be calculated using a mass balance or energy balance calculation. Other measured parameters that are used in the calculation of the emissions will be used to validate the results. The mass balance or energy balance calculation, and the theories on which they are based, must be clearly explained and presented to the verifier at the same time as the calculated results.

Data processing in case of malfunction of the abatement system

Section 4.5.2 of the methodology states: ”in order to take into account problems that may occur with the catalyst, all gas volume flow and N_2O concentration values recorded during periods where the N_2O concentration exceeds a value (expressed in mg/Nm3) equivalent to 2,5 kgN_2O/tHNO_3 (to be determined by the project proponent and identified during the verification) will be excluded from the calculation of the project emissions factor and no ERUs shall be claimed for the corresponding quantities of nitric acid produced during those operating hours”.

Furthermore, if any missing data corresponds to a period of failure of the abatement technology, one should adopt the principle that the emissions have not been treated by the abatement technology during the whole of the hour in question and that substitute values have been calculated as a result.

Measurement during standard plant operation

Only those data sets collected during normal operation of the plant shall be used as a basis for determining the Verification Period specific project emissions. Most plants have one or more trip point values, normally defined by the manufacturer and specified in the plant’s operating manuals. At GPN, the plant’s operational status can be determined by whether or not the measurements of oxidation temperature and ammonia to air flow ratio are within the defined range of trip point values. If one of these parameters is outside the range specified by the trip point values, the plant should automatically shut down. Since the plant at Grandpuits has four AORs, the trip point parameters will be continuously monitored for all burners. If one burner registers values that lie outside the trip point parameters, all four burners will automatically shut down.

Consequently, all NCSG and VSG data sets recorded at times when the plant was considered to be out of operation must automatically be excluded from the calculation of project N_2O emissions. This data-elimination process is applied to the hourly average values supplied to N.serve by the plant. The number of operating hours (OH_n) will be reduced accordingly. However, the number of tonnes of nitric acid produced (NAP_n) will not be adjusted. This is because the HNO3 flow measured in the period immediately following a plant trip represents the flow of the nitric acid that was remaining in the absorption column after the trip and was actually produced before the plant shutdown. This quantity of HNO_3 is therefore associated with a period when the plant was functioning within its normal operating parameters and must therefore be included in the calculation of NAP_n.

For the avoidance of doubt, data sets containing values beyond the range of the specified trip point values are not to be regarded as AMS downtime readings (as defined above).

Application of instrument correction factors / elimination of implausible values

The correction factors derived from the calibration curve of the QAL2 audit for all components of the AMS, as determined during the QAL2-test in accordance with EN14181, must be applied onto both VSG and NCSG, unless these were already automatically applied to the raw data recorded by the data storage system at the plant.

For all N_2O data sets a plausibility check is conducted in accordance with current best practice monitoring standards. All data sets containing values that are implausible are eliminated.

Any implausible data (for example during plant shut-down or AMS downtime) and any extreme values are to be automatically eliminated using the following statistical procedure:

(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

Permitted overall uncertainty

For each emission source, the permitted overall uncertainty of the average hourly annual emissions must be less than 7.5%. The next level, and the maximum allowed, is 10%, which can only be applied if it can be proven to the satisfaction of the competent authority that the application of the 7.5% level is technically impossible to achieve or that it would entail excessive costs.

If the total established uncertainty is higher than the permitted overall uncertainty, the project-specific emissions are to be increased by the difference between the established uncertainty value and the permitted overall uncertainty value.

Calculation of the EF_n-value

The total mass of N_2O emissions in a Verification Period (PE_n) is the product of the remaining valid $NCSG_n$ and VSG_n-values multiplied by OH_n.

The following equation is used:

$$PE_n = VSG_n * NCSG_n * OH_n * 10^{-6} \qquad (kgN_2O)$$

The plant-specific project emissions factor representing the average N_2O emissions per tonne of nitric acid over the respective Verification Period is derived by dividing the total mass of N_2O emissions by the total output of 100% concentrated nitric acid for that period.

The average N_2O emissions per metric ton of 100% concentrated nitric acid for the Verification Period (PE_n) shall then be calculated as follows:

$EF_n = (PE_n / NAP_n)$ $(kgN_2O/tHNO_3)$

where:

Variable	Definition
PE_n	total specific N_2O emissions during the Verification Period (kgN_2O)
EF_n	Emissions factor used to calculate the emissions from the defined Verification Period n ($kgN_2O/tHNO_3$)
$NCSG_n$	Mean concentration of N_2O in the tail gas stream during the Verification Period (mgN_2O/m^3)
OH_n	Operating hours of the plant during the Verification Period (h)
VSG_n	Mean tail gas volume flow rate during the Verification Period (m^3/h)
$NAP_{n`}$	Nitric acid production during the Verification Period ($tHNO_3$)

Allocation of ERUs

The **emission reductions based on which ERUs will be issued** for the project activity are determined by deducting the project-specific emission factor from the Benchmark Value and multiplying the result by the production output of 100% concentrated nitric acid over the period for which ERUs are to be claimed and the GWP of N_2O, as shown in the calculation below. In addition, the Arrêté of 2 March 2007 states: “the total amount of issued Emission Reduction Units equates to 90% of the GHG emissions effectively avoided due to the implementation of the project activity”.

$ERU = ((EF_{BM}{}^{36} - EF_n)/1000 \times NAP_n \times GWP_{N2O}) * 0.9$ (tCO_2e)

Where:

Variable	Definition
ERU =	Emission reductions awardable to the project for the Verification Period (tCO_2e)
NAP_n =	Nitric acid production for the Verification Period n ($tHNO_3$).
EF_{BM} =	Emissions Factor Benchmark according to host country approval ($kgN_2O/tHNO_3$); see section A.4.3 (last paragraph) of the PDD for further information.
EF_n =	Emissions factor used to calculate the emissions from the defined Verification Period n ($kgN_2O/tHNO_3$).
GWP_{N2O} =	Global Warming Potential : 310 tCO_2e/tN_2O

In accordance with the methodology, at any point during the project crediting period for which an applicable regulatory limit on N_2O emissions is lower than that of the benchmark

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[36] Or EF_{reg}, as applicable in accordance with section A.4.3 above

emissions factor, the regulatory level will replace the benchmark emissions factor in the calculation of the ERUs to be awarded to the project.

For the avoidance of doubt, ERU reductions for production periods with emission levels above the applicable Benchmark Emissions Factor DO NOT apply!

In accordance with the methodology, no leakage calculation is required, because the technology used is a secondary catalyst, not a tertiary. As such, neither ammonia nor hydrocarbons are used as reducing agents or for co-firing in the operation of the catalyst technology installed.

B.6.2. Data and parameters determined prior to validation

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Table 4. Default factors

Data / Parameter	*Global Warming Potential of N2O*
Symbol	GWP_{N2O}
Unit	tCO_2e/tN_2O
Source	*Climate Change 1995, The Science of Climate Change: Summary for Policymakers and Technical Summary of the Working Group I Report, page 22.*
Applicable value	*310*
Justification of choice of value	*To comply with the requirements of the Kyoto Protocol*
Comments	*310 until 31st December 2012 and 298 from 1st January 2013. Subject to revisions in accordance with Art. 5 Kyoto Protocol.*

Data / Parameter	*Specific reference value (benchmark emissions factor) that will be applied to calculate the emissions reductions from a specific Verification Period*
Symbol	EF_{BM}
Unit	$kgN_2O/tHNO_3$
Source	*Determined according to French government decision (MEEDDM)*
Applicable value	*2.5kg* $N_2O/tHNO_3$ *until end 2011 and 1.85kg thereafter until end 2012*
Justification of choice of value	*Decision taken by the MEEDDM in April 2009*
Comments	*To be determined for each verification period in accordance with the host country decision. See section A.4.3 of the PDD for additional information. Project proponents reserve the right to change the applicable values in the case where they may be subsequently revised by the MEEDDM.*

Data / Parameter	*Emissions cap for* N_2O *from nitric acid production set by government/local regulation*
Symbol	EF_{reg}
Unit	$kgN_2O/tHNO_3$ *(converted, if necessary)*
Source	*GPN Grandpuits plant-specific ‘arrêté préféctoral’ issued by the DRIRE on 4th June 2009*
Applicable value	*4 (applicable from next gauze change onwards – December 2009)*
Justification of choice	*Mandatory applicable limit*

of value	
Comments	*Continuous surveillance throughout crediting period.*

Table 5. Data and parameters determined prior to validation

Data / Parameter	*Ammonia Oxidation Temperature Trip Point Range*
Symbol	OT_{range}
Unit	*ºC*
Source	*Plant operating manuals*
Applied value	*800 – 930*
Description of methods used to obtain this value (measurements, calculations, procedures etc)	*Value taken from plant operating manuals*
Comments	

Data / Parameter	*Maximum Ammonia to Air Ratio – trip point value*
Symbol	$AIFR_{max}$
Unit	*%*
Source	*Plant operating manuals*
Applied value	*12.5%*
Description of methods used to obtain this value (measurements, calculations, procedures etc)	*Value taken from plant operating manuals*
Comments	

B.6.3. Ex ante calculation of emission reductions

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Emission reductions achievable by the proposed project activity will be dependent on the amounts of nitric acid produced. In accordance with the methodology “Catalytic reduction of N_2O at nitric acid plants”, emission reductions are determined pro unit of product measured in metric tonnes of 100% concentrated nitric acid produced. Although the maximum production capacity is theoretically 425,000 $tHNO_3$, this is not considered a realistically achievable figure for the coming years.

GPN Grandpuits has therefore predicted the following production amounts:

Year	**Expected production ($tHNO_3$)**
2010 (April - Dec only)	294,750
2011	393,000
2012	393,000
Following years	393,000

Table 6: Budgeted nitric acid production

Based on these production figures, one can make assumptions on how much N_2O would be emitted into the atmosphere during the project activity. As described in section A.4.3 above, a benchmark value will be applied for calculating the ERUs to be awarded for the project. The project proponents will only receive ERUs for the difference between the applicable benchmark value and the emission levels of the project activity.

Estimated project emissions (compared to operation without N_2O catalyst)

Accordingly, the **following assumptions** apply to the establishment of the emissions reductions:

- The project activity will become eligible to receive ERUs on receipt of the official government LoA (expected end March 2010) or at the latest two months after submission of the Project Dossier applying for a LoA.
- GPN Grandpuits produces the amounts of nitric acid according to the production budget provided above, each year's production being equally distributed throughout the period;
- To be able to calculate the estimated project emissions factor, a factor for the average emissions prior to catalyst installation has been established. Factual emissions from the plant without any abatement catalyst would be 3.99 $kgN_2O/tHNO_3$[37]; This will be defined as the 'pre-project emissions factor'.
- The secondary catalyst employed performs with an average abatement efficiency of 65.4% throughout the project's lifetime (resulting in project emissions of 1.38kg $N_2O/tHNO_3$)[38];

The following equations are used for estimating the emissions reductions to be achieved by the project and form the basis for the figures displayed in the tables below:

$$PE_y = EF_{PP} \times (100\% - AE) \times NAP_y / 1000 \times GWP_{N2O} \quad (tCO_2e)$$

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[37] See footnote 23 for more detailed information

[38] Since the SCR de-NOx catalyst unit at the end of the production process at GPN tends to generate some additional N2O (around 30ppm), this must be taken into account when assessing the expected project emissions that will be measured in the tail gas stack. Although the guaranteed abatement efficiency of the catalyst is actually 70%, the additional N_2O generated by the de-NOx unit would result in a net reduction of 65.4%, rather than 70%, of N_2O emissions. Explanation of calculation: Pre-cat emissions = 3.99kg/t (638ppm), minus catalyst abatement efficiency at 70% = 191ppm. However, since the SCR unit adds approx 30ppm, the actual reading would in reality be 221ppm (1.38kg/t). The actual reduction is therefore 2.61kg/t (3.99kg – 1.38kg), which equates to 65.4% of the pre-cat emissions factor.

Where:

Variable Definition

PE_y = Estimated Project Emissions during one year (tCO_2e)

EF_{PP} = Pre-Project Emissions Factor, calculated in accordance with the third bullet point above ($kgN_2O/tHNO_3$)

AE = Estimated Abatement Efficiency of secondary catalyst (%)

NAP_y = Estimated nitric acid production during one year ($tHNO_3$).

GWP_{N2O} = 310 tCO_2e/tN_2O until end 2012 and 298 tCO_2e/tN_2O from 2013 onwards

$$BE_y = EF_{BM} \times NAP_y/1000 \times GWP_{N2O} \qquad (tCO_2e)$$

Where:

Variable Definition

BE_y = Estimated Benchmark Emissions during one year (tCO_2e)

EF_{BM} = Benchmark Emissions factor according to host country approval ($kgN_2O/tHNO_3$); see section A.4.3 of the PDD for further information.

NAP_y = Estimated nitric acid production during one year ($tHNO_3$).

GWP_{N2O} = 310 tCO_2e/tN_2O until 2012 and 298 tCO_2e/tN_2O from 2013 onwards

$$ERU_{PIS} = BE_y - PE_y \qquad (tCO_2e)$$

Where:

Variable Definition

ERU_{PIS} = Estimated number of ERUs to be issued to the project (tCO_2e)

BE_y = Estimated Benchmark Emissions during one year (tCO_2e)

PE_y = Estimated Project Emissions during one year (tCO_2e)

Using the above assumptions and equations, the following emissions are estimated for the Project Activity:

Crediting Period Year	**Project Emissions (tCO_2e)**
2010	126,094
2011	168,125
2012	168,125
TOTAL (until 2012)	**462,345**

Table 7 (part A): Project emissions until 2012

Crediting Period Year	Project Emissions (tCO_2e)
2013	161,617
2014	161,617
2015	161,617
2016	161,617
2017	161,617
2018	161,617
2019	161,617
2020 (Jan - Mar only)	40,404
TOTAL (over 10 year crediting period)	**1,634,070**
Average (over 10 year crediting period)	**163,407**

Table 7 (part B): Project emissions from 2013 onwards.

* Due to the likely inclusion of N_2O emissions from nitric acid production into the EU ETS from 1st January 2013 onwards, the project may not be eligible to earn ERUs after that time, or continuing the project under the JI may not be economically viable. Also, from 2013 onwards a GWP of 298 for N_2O as defined by the IPCC Third Assessment Report will be applied. This is why this PDD differentiates between prospective emission reductions achieved until 31st December 2012 and emissions reductions generated from 1st January 2013 onwards.

Reference Scenario (benchmark/Business as Usual) emissions

Since a Benchmark Value must be applied to the project[39], calculated reference emissions are represented through the value 2.5 $kgN_2O/tHNO_3$ until the end of 2011, while the benchmark value of 1.85kg $kgN_2O/tHNO_3$ will be applicable from the 1st January - 31st December 2012.

The benchmark value that would be applicable from 1st January 2013, in the case where a project would still be feasible, is unknown. In order to ensure a conservative estimate of the number of emissions reductions achievable during the crediting period, we will assume a tentative benchmark level of 1.5kg. This future level is purely speculative. It is more appropriate than any other figure, simply for the reason that 1.5kg was mentioned by the MEEDDM during discussions in April 2009 as an example of a possible limit for N_2O emissions from 2013 onwards.

Crediting Period Year	Benchmark Scenario Emissions (tCO_2e)
2010	228,431
2011	304,575
2012	225,386
TOTAL (until 2012)	**758,392**

Table 8 (part A): Reference scenario (benchmark) emissions until 2012

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[39] See section A.4.3 (last paragraph) of the PDD for additional information.

Crediting Period Year	**Benchmark Scenario Emissions (tCO_2e)**
2013	175,671
2014	175,671
2015	175,671
2016	175,671
2017	175,671
2018	175,671
2019	175,671
2020 (Jan - Mar)	43,918
TOTAL (over 10 year crediting period)	**2,032,007**
Average (over 10 year crediting period)	**203,201**

Table 8 (part B): Hypothetic reference scenario (benchmark) emissions from 2013 onwards.

* Due to the likely inclusion of N_2O emissions from nitric acid production into the EU ETS from 1st January 2013 onwards, the project may not be eligible to earn ERUs after that time, or continuing the project under the JI may not be economically viable. Also, from 2013 onwards a GWP of 298 for N_2O as defined by the IPCC Third Assessment Report will be applied. This is why this PDD differentiates between prospective emission reductions achieved until 31st December 2012 and emissions reductions generated from 1st January 2013 onwards.

B.6.4. Summary of ex ante estimate of emission reductions

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Year	**Estimate of project activity emissions** (tonnes of CO_2e)	**Estimate of Benchmark scenario emissions** (tonnes of CO_2e)	**Leakage estimate** (tonnes de CO_2e)	**10% deduction** (tonnes de CO_2e)	**Estimate of final emission reductions** (tonnes of CO_2e)
2010	126,094	228,431	N/A	10,234	92,103
2011	168,125	304,575	N/A	13,645	122,805
2012	168,125	225,386	N/A	5,726	51,534
Total (tonnes of CO_2e)	**462,345**	**758,392**		**29,605**	**266,442**

Table 9. Summary of estimation of emission reductions

B.7. Application of the monitoring methodology and description of monitoring plan

B.7.1. Measured data and parameters

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Table 10. Data and parameters measured during the project activity

Data / Parameter P.1	*Average N_2O concentration in the tail gas during project Verification Period n.*
Symbol	*$NCSG_n$*
Unit	*mgN_2O/Nm^3*
Source	*Finetech Orbital FTIR Continuous Emissions N_2O Analyser (part of AMS)*
Measurement Frequency	*Hourly average value based on measurements recorded every 10 seconds*
Value applied for emissions reductions calculations in section B.6.	*Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.*
Applied measurement procedures	*Measurements with Finetech Orbital FTIR analyser automatically recorded every 10 seconds.*
Applied quality assurance and control procedures	*AMS is subject to regular checking and calibrations that will take place according to vendor specifications and EN14181*
Comments	

Data / Parameter P.2	*Average Volume flow rate of the tail gas during project Verification Period n.*
Symbol	*VSG_n*
Unit	*Nm^3/h*
Source	*gas volume flow meter (part of AMS)*
Measurement Frequency	*Hourly average value based on measurements recorded every 10 seconds*
Value applied for emissions reductions calculations in section B.6.	*Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.*
Applied measurement procedures	*Measurements recorded every 10 seconds with Sick Maihak 'Flowsick 100' ultrasonic flow meter*
Applied quality assurance and control procedures	*AMS is subject to regular checking and calibrations that will take place according to vendor specifications and EN14181*
Comments	*The data output from the tail gas flow meter will be processed using the plant's OSI Plant Information data collection and storage system.* *Corrected for standard conditions (273,15 °K, 1013, 25 hPa) using TSG (P.10) and PSG (P.11) data.*

Data / Parameter P.3	*N_2O emissions during project Verification Period n.*
Symbol	*PE_n*
Unit	*kgN_2O*
Source	*Calculation from measured data*
Measurement	*Calculated after Verification Period has been defined by the project*

Frequency	*proponents*
Value applied for emissions reductions calculations in section B.6.	*Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.*
Applied measurement procedures	*Not applicable, calculated value as per the following formula:* $PEn = VSG * NCSG * OH* 10^{-6}$
Applied quality assurance and control procedures	*Not applicable*
Comments	

Data / Parameter P.4	*Total operating hours of Verification Period*
Symbol	OH_n
Unit	*Hours*
Source	*Production Log – taking into account the relevant trip point parameters*
Measurement Frequency	*Based on measurements of OT and AIFR taken every 30 seconds to determine whether or not the plant is in operation.*
Value applied for emissions reductions calculations in section B.6.	*Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.*
Applied measurement procedures	*Plant manager records the hours of full operation of the plant on a continuous Basis.*
Applied quality assurance and control procedures	*Not applicable*
Comments	*May be amended according to trip point values (see section B.6.1 above).*

Data / Parameter P.5	*Metric tonnes of 100% concentrated nitric acid during any Verification Period*
Symbol	NAP_n
Unit	$tHNO_3$
Source	*Nitric acid flow meter*
Measurement Frequency	*Measurements recorded every 30 seconds throughout the Verification Period*
Value applied for emissions reductions calculations in section B.6.	*Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.*
Applied measurement procedures	*Hourly average value derived from flow, density and temperature measurements taken every 30 seconds and calculated at 100% concentration.*
Applied quality assurance and control procedures	*Checked during regular plant maintenance in accordance with the relevant quality assurance requirements.*
Comments	

Data / Parameter P.6	*Oxidation temperature in the ammonia oxidation reactor (AOR).*
Symbol	*OT*
Unit	*℃*
Source	*Thermocouples inside the AOR*
Measurement Frequency	*Hourly average value based on measurements recorded every 30 seconds*
Value applied for emissions reductions calculations in section B.6.	*Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.*
Applied measurement procedures	*Measured*
Applied quality assurance and control procedures	*Checked during regular plant maintenance.*
Comments	

Data / Parameter P.7	*Ammonia Flow rate to the ammonia oxidation reactor (AOR)*
Symbol	*AFR*
Unit	$kgNH_3/h$
Source	*Ammonia flow meter*
Measurement Frequency	*Hourly average value based on measurements taken every 30 seconds*
Value applied for emissions reductions calculations in section B.6.	*Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.*
Applied measurement procedures	*Measured.*
Applied quality assurance and control procedures	*Checked during regular plant maintenance.*
Comments	

Data / Parameter P.8	*Ammonia to air ratio going into the ammonia oxidation reactor (AOR)*
Symbol	*AIFR*
Unit	*%*
Source	*Ammonia & Air flow meters*
Measurement Frequency	*Hourly average value based on measurements taken every 30 seconds*
Value applied for emissions reductions calculations in section B.6.	*Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.*
Applied measurement	*Monitored & calculated*

procedures	
Applied quality assurance and control procedures	*Checked during regular plant maintenance.*
Comments	

Data / Parameter P.9	*Temperature of tail gas*
Symbol	*TSG*
Unit	*℃*
Source	*Probe (part of the gas volume flow meter).*
Measurement Frequency	*Hourly average value based on measurements taken every 10 seconds*
Value applied for emissions reductions calculations in section B.6.	*Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.*
Applied measurement procedures	*Monitored.*
Applied quality assurance and control procedures	*AMS is subject to regular checking and calibrations that will take place according to vendor specifications and EN14181*
Comments	*May not be recorded, if AMS / data storage system adjusts flow measurements to standard conditions automatically*

Data / Parameter P.10	*Pressure of tail gas*
Symbol	*PSG*
Unit	*Pa*
Source	*Probe (part of the gas volume flow meter).*
Measurement Frequency	*Hourly average value based on measurements taken every 10 seconds*
Value applied for emissions reductions calculations in section B.6.	*Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.*
Applied measurement procedures	*Monitored. Alternatively, a default value will be applied in case of stack pressure conditions with little variation. The default value will be determined by the auditor during the QAL2 audit in accordance with EN14181.*
Applied quality assurance and control procedures	*AMS is subject to regular checking and calibrations that will take place according to vendor specifications and EN14181*
Comments	*May not be recorded, if AMS / data storage system adjusts flow measurements to standard conditions automatically*

Data / Parameter P.11	*Emissions factor calculated for project Verification Period n*
Symbol	EF_n

Unit	*kgN_2O / $tHNO_3$*
Source	*Calculated from measured data following procedures detailed in B.6.1*
Measurement Frequency	*After each Verification Period*
Value applied for emissions reductions calculations in section B.6.	*Estimated Project Emission factor is: 1.38 $kgN_2O/tHNO_3$ (based on 65.4% abatement efficiency from a level of 3.99kg prior to the installation of the secondary catalyst)*[40]
Applied measurement procedures	*The Verification Period specific emissions factor for each Verification Period during the project's crediting period is calculated by dividing the total mass of N_2O emissions during that Verification Period by the total production of 100% concentrated nitric acid during that same Verification Period. For Verification Period n the emission factor would be:* $EFn = (PEn / NAPn) \quad (kgN_2O/tHNO_3)$
Applied quality assurance and control procedures	
Comments	

Data / Parameter P.12	*Emissions cap for N_2O from nitric acid production set by government/local regulation*
Symbol	EF_{reg}
Unit	*kgN_2O / $tHNO_3$ (converted if necessary)*
Source	*National or local N_2O emissions legislation*
Measurement Frequency	*After each Verification Period*
Value applied for emissions reductions calculations in section B.6.	*4kg from next gauze change onwards (December 2009).*
Applied measurement procedures	*If this regulatory limit is LOWER than the applicable benchmark emissions factor, then EF_{reg} shall replace EF_{bm} in the calculation of ERUs:* $ERU = (EF_{reg} - EF_n)/1000 \times NAP_n \times GWP_{N2O} \quad (tCO_2e)$
Applied quality assurance and control procedures	
Comments	

B.7.2. Description of the monitoring plan

The emissions reductions achieved by the project activity will be monitored in accordance with sections 4, 5 and 6 of the projet domestique methodology "Catalytic reduction of N_2O at

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[40] See footnote 38 for details

nitric acid plants" as prepared by N.serve Environmental Services GmbH, Germany, and Rhodia Energy Services, France.

The above methodology requires the project participants to install and maintain automated monitoring technology in accordance with the latest European or national standards and norms (for example, either the European Norm EN14181, the French AFNOR standard XP X43-305, as applicable, or any other monitoring standard considered acceptable in accordance with the requirements for assessing plant emissions in order to calculate payable N_2O tax[41] , always in their most up-to-date versions, including any applicable successor standards as valid at the time of project application). N.serve and GPN have chosen to use European Norm EN14181 (2004) *"Stationary source emissions - Quality assurance of automated measuring systems"*[42] as a guidance for installing and operating the Automated Monitoring System (AMS) at GPN Grandpuits for the monitoring of N_2O emissions.

An Automated Measuring System (AMS) consisting of the following shall be used for monitoring:

- An automated gas analyzer system that will continuously measure the concentration of N_2O in the tail gas of the plant; and
- A gas volume flow meter that uses ultrasonic technology to continuously monitor the gas volume flow, temperature and pressure, in the tail gas of the plant.

Sampling shall be carried out continuously using a sampling tube that is optimised to the specific width and height of the tail gas duct, and the expected gas velocities in the tail gas. Temperature and pressure in the tail gas will also be measured continuously and used to calculate the gas volume flow at standard conditions.

Description of the AMS to be installed at GPN Grandpuits nitric acid plant.

1. General Description of the AMS

Grandpuits is currently equipped with an older Finetech 'Orbital AIT' FTIR analyser, but will be replaced with a new Finetech Orbital FTIR analyser hot extractive for the purposes of measuring N_2O emissions throughout the project activity. The Finetech Orbital is a state-of-the-art hot extractive AMS consisting of a Continuous Emissions Analyser, a sample probe, heated filter and a heated sample-line connected directly to the analyser. The plant has an 'OSI Plant Information' data collection and storage system, which will be programmed to log and store raw data for the duration of the project activity.

Since this nitric acid plant has been in operation since 1970, GPN Grandpuits staff in general, and its instrument department in particular, are accustomed to operating technical equipment adhering to high quality standards.

At the time of the Determination, the following staff at the nitric acid plant are designated as being responsible for the ongoing operation of the project and for the quality assurance and

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[41] Payable in accordance with Article 45 of the Loi de Finances 1999 and Article 266 nonies of the Code des Douanes

[42] This standard describes the quality assurance procedures needed to assure that an Automated Measuring System (AMS) installed to measure emissions to air are capable of meeting the uncertainty requirements on measured values given by legislation, e.g. EU Directives, or national legislation, and more generally by competent authorities.

maintenance of the N_2O monitoring system. The responsible people may change throughout the course of the project crediting period:

M. Eric Delaunay	Plant Manager
M. Dominique Bournon	Electrical Instrumentation Department Manager
M. Benjamin Lefebvre	Analyser Technician

Operation, maintenance and calibration intervals will be carried out by staff from the instrument department according to the vendor's specifications and under the guidance of internationally relevant environmental standards, in particular EN 14181 (2004). Service will be performed by the supplier of the AMS.

All monitoring procedures at GPN Grandpuits are also conducted and recorded in accordance with the procedures under ISO 9001 and ISO 14001, which is currently audited once every three years by a certified independent auditing organisation accredited for ISO 9001 and 1400 certification.

2. Sample points

The sample points were chosen in accordance with the AMS requirements, EN 14181 requirements and the plant design specifications to ensure optimum quality of the collected data. The most suitable location at Grandpuits for the sample points for the measurement of N_2O [NCSG] and tail gas flow [VSG] is in the horizontal section of the tail gas pipe, downstream of all process equipment and before the stack.

3. Analyser

The Finetech Orbital FTIR Continuous Emissions Analyser is capable of analysing N_2O concentration in gas mixtures. It is an extractive, continuous measuring system and extracts a partial gas flow from the flue gas, which is led to the analyser through a heated line.

In the case where the chosen analyser cannot be proven to fulfil the requirements of QAL1, compliance with EN14181 will still be maintained by proving the suitability of the analyser for the project during the QAL2 audit, which will be performed by an independent laboratory with EN ISO/IEC 17025 accreditation following commissioning. In any case, complete adherence to the requirements of EN14181 is not required by the methodology (see section 7 of the methodology 'Monitoring Plan' for full details)[43].

4. Flow Meter

Currently, the tail gas flow measurement at the plant is calculated using measurements of primary and secondary air flow rates to the ammonia burner and the oxygen concentration in

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[43] At the CDM EB meeting 48, it was decided that the use of EN14181 is not a mandatory requirement under AM0034 as long as comparable national or international standards are used (see clause 30.b of the report at http://cdm.unfccc.int/EB/048/eb48rep.pdf)

the tail gas. For the purposes of complying with EN14181 during the project activity, a Sick Maihak 'Flowsick 100' stack gas flow meter will be installed at the plant for continuous determination of the flow rate of stack gas. The flow measuring device is a highly sensitive system for continuous, in-situ flow measurement.

The flow meter will also conduct the internal measurement of the absolute stack gas pressure (PSG) and the stack gas temperature (TSG).

Linking this device with the OSI PI data acquisition system, the data flows can be converted from operating to standard conditions, taking into account the other flow parameters such as temperature and pressure.

5. The data acquisition system

The GPN Grandpuits nitric acid plant is equipped with an 'OSI Plant Information' data collection and storage system that will collect and store all the values for NCSG, VSG, TSG and PSG, NAP, as well as the relevant trip point parameters from the nitric acid plant that define whether or not the plant is in operation (ammonia oxidation temperature, air flow rate and ammonia flow rate). This data will be stored for the duration of the project activity and for two years thereafter.

6. Data evaluation

The nitric acid plant operator derives hourly averages for all of the monitored parameters from the plant-specific data management system. This data is exported to EXCEL-format and delivered by email or on CD to N.serve by the plant operator. N.serve is responsible for the correct analysis of the delivered data in accordance with the PDD.

At N.serve the received data is stored on the N.serve fileserver in a special section for the storage of monitoring data separately for each project. The files are protected against manipulation by a password. At the time of writing this PDD, Martin Stilkenbäumer at N.serve is responsible for the correct data handling and processing. The responsible person may change throughout the course of the project crediting period.

After a first plausibility check the data is transferred to a special data bank system. All necessary calculations and necessary steps of data analysis of the monitored data are carried out by N.serve using the data bank tool in accordance with the regulations and requirements of the methodology "Catalytic reduction of N_2O at nitric acid plants", as outlined in this PDD.

The results of the data analysis are transferred to an Excel spreadsheet. The results are used for calculation of project emissions, as well as for the preparation of the Monitoring Reports.

7. AMS QA procedures

The following section describes how the procedures specified in EN14181 for QAL1, 2 and 3 will be adapted and practically applied at the GPN Grandpuits nitric acid plant.

QAL 1

The selected AMS shall ideally have been proven suitable for its measuring task (parameter and composition of the flue gas) by use of the QAL1 procedure as specified by EN ISO 14956. This standard’s objective is to prove that the total uncertainty of the results obtained from the AMS meets the specification for uncertainty stated in the applicable regulations. Such suitability testing has to be carried out under specific conditions by an independent third party on a specific testing site.

A test institute should perform all relevant tests on the AMS. The AMS should be tested in the laboratory and field.

The chosen gas analyser should ideally be QAL1 tested for the measurement of all standard components that usually are measured in the waste gas of large combustion plants, waste incineration plants or mechanical biological waste treatment plants.

However, in the case where the chosen analyser cannot be proven to fulfil the requirements of QAL1, compliance with EN14181 will still be maintained by proving the suitability of the analyser for the project during the QAL2 audit, which will be performed by an independent laboratory with EN ISO/IEC 17025 accreditation following commissioning. In any case, complete adherence to the requirements of EN14181 is not required by the methodology (see section 7 of the methodology ‘Monitoring Plan’ for full details)[44].

QAL2

QAL2 is a procedure for the determination of the calibration function and its variability, and a test of the variability of the measured values of the AMS compared with the uncertainty given by legislation. The QAL2 tests are performed on suitable AMS that have been correctly installed and commissioned on-site (as opposed to QAL 1, which is conducted off-site). QAL2 tests are to be performed at least every 3 years according to EN 14181. A QAL2 test of the Finetech analyser will be conducted as soon as possible after commissioning, in early 2010.

A calibration function is established from the results of a number of parallel measurements performed with a Standard Reference Method (SRM). According to EN14181, the QAL2 test, including the SRM, needs to be conducted by an independent “testing house” or laboratory, which has to be accredited to EN ISO/IEC 17025.

AST

In addition, Annual Surveillance Tests (AST) should be conducted in accordance with EN 14181; these are a series of measurements that need to be conducted with independent measurement equipment in parallel to the existing AMS. The AST tests are performed annually. In the years in which a full QAL 2 test is performed (at least every 3 years), an additional AST test is not necessary.

QAL3

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[44] See footnote 43

QAL3 describes the ongoing quality assurance and maintenance procedures and documentation for the AMS conducted by the plant operator. This documentation should demonstrate that the AMS is in control during its operation so that it continues to function within the required specifications for uncertainty.

This is achieved by conducting periodic zero and span checks on the AMS. Zero and span adjustments or maintenance of the AMS may be necessary depending on the results of the evaluation. In essence, GPN Grandpuits staff performs QAL3 procedures through the established calibration procedures described below.

AMS calibration and QA/QC procedures

The monitoring equipment used to derive the N_2O emissions data for this project will be made part of the ISO 9001 procedures.

N_2O-Analyser Zero Calibration

Conditioned ambient air is used as reference gas for zero calibration. The zero calibration is conducted automatically every 24 hours. Manual calibrations are done once per month (the calibration frequency might be adjusted if necessary).

N_2O-Analyser Span calibration

Manual span calibrations are done with certified calibration gas once per month (the calibration frequency might be adjusted if necessary).

The calibration results and subsequent actions are all documented as part of the QAL3 documentation. In addition, the analyser room and equipment is visually inspected once a week and the results are documented in analyser-specific log books.

Flow meter calibration procedures

The flow meter itself does not need to be calibrated since it is a physical device that will not have drift. Therefore, it is sufficient to regularly inspect the physical condition of the device. It is checked regularly for the following: Visual check; electric check; cleaning of probe if necessary. In addition, the measurement results of the flow meter are of course checked during the QAL2 and AST tests by an independent laboratory by comparison with a Standard Reference Method (SRM).

B.8. Date of finalisation of application of the reference scenario and monitoring methodology and the name of the person/entity responsable

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The N_2O concentration in the stack that was measured over a period of 13 months from December 2007 to December 2008 with the Heraeus FTC primary catalyst gauzes (and no secondary N_2O abatement catalyst), showed an average concentration equal to approximately 3.99 $kgN_2O/tHNO_3$[45].

This value of 3.99 $kgN_2O/tHNO_3$ has been used as a basis for calculating the expected project emissions factor that will result from the installation of catalyst for the project activity, assuming an abatement efficiency of 65.4%[46].

However, due to the application of a benchmark emissions factor for calculating the emissions reductions achieved by the project, there is no measured baseline to be established. The MEEDDM established fixed benchmark values (as specified in section A.4.3) on the 10th April 2009.

SECTION C. Duration of the project activity/crediting period

C.1. Duration of the project activity

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C.1.1. Date of commencement of the project activity

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The French Projet Domestique rules state that a project shall only be eligible to receive ERUs for emissions reductions achieved following either a) the receipt of the final official Letter of Approval (LoA) from the MEEDDM or b) from the date two months after submission of the full project documentation and request for LoA to the MEEDDM, whichever is the earlier. Since the full project documentation (which includes the draft Determination Report) has not yet been submitted, the exact date of commencement of the crediting period is impossible to specify. However, the final approval (and therefore the official date of project commencement) is expected by the beginning of April 2010.

C.1.2. Anticipated duration of the project's operational life

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The anticipated duration of the project's operational life is 2 years and 9 months (until the end of December 2012), since it is expected that N_2O emissions from HNO_3 plants will be covered by the EU ETS from 2013 onwards and that the project will no longer be viable[47]. If this is not the case, and N_2O is not otherwise regulated in a way that prohibits the continuation of the project, the project's operational life will be 10 years, in accordance with the crediting period specified in C.2.2 below.

C.2. Crediting Period

C.2.1. Date of commencement of the crediting period

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[45] See footnote 23 for details

[46] See footnote 38 for details

[47] See footnote 30

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In accordance with the methodology “Catalytic reduction of N_2O at nitric acid plants”, the project shall be eligible to receive ERUs for all emissions reductions physically achieved following either: a) the receipt of the final official Letter of Approval (LoA) from the MEEDDM or b) from the date two months after submission of the full project documentation and request for LoA to the MEEDDM, whichever is the earlier. Since the full project documentation (which includes the Determination Report) has not yet been submitted, the exact date of commencement of the crediting period is impossible to specify. However, the final approval (and therefore the official date of project commencement) is expected by the beginning of April 2010.

C.2.2. Duration of the crediting period

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The Project Participants herewith apply for a crediting period of 10 years. The Projet Domestique will be terminated earlier if there is a legal requirement to do so. All laws relevant for this project[48] will be complied with at all times during the chosen crediting period.

SECTION D. Environmental Impacts

D.1. Documentation concerning Environmental Impact Assessment

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The project will reduce gaseous emissions of nitrous oxide (N_2O) from the plant tail gas and will therefore contribute to international efforts to reduce greenhouse gas emissions. The project will have no negative effects on local air quality.

The project will have no impact on water pollution. No additional water is required for the project activity’s implementation or operation. Therefore, there is no impact on the sustainable use of water.

Also, the project does not impact on the community’s access to other natural resources as it will not require any additional resources. Also, there is no impact on the efficiency of resource utilization.

The N_2O abatement catalyst will be leased from Heraeus, a German supplier. The catalyst will be returned to the supplier, where the precious metals will be recovered and the ceramic pellets will be disposed of in accordance with EU regulations, thus fulfilling sustainability standards.

There are no other positive or negative impacts on the environment.

The French DFP confirmed by email correspondence that it is not necessary to undertake an environmental impact assessment in the context of a project designed merely to reduce emissions of N_2O.

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[48] See section B.1 above for more detailed information.

D.2. If the impact on the environment is considered significant by the project participants or by the French administration, please provide conclusions and all reference documentation from the Environmental Impact Assessment in accordance with the procedures required by the French administration

>>
not applicable

SECTION E. Local Stakeholder Consultation

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There is no requirement in the French methodology “Catalytic reduction of N_2O at nitric acid plants” to conduct a Local Stakeholder Consultation.

As the JI project does not have any relevance for local air, water or soil emissions, a local stakeholder consultation is not considered necessary.

ANNEXES

Annex 1. Contact details of the project participants

Organisation	GPN S.A.
Street/P.O Box	*16-40 Rue Henri REGNAULT*
Building	
Town	COURBEVOIE
Postcode	92400
Country	France
Telephone	+33 14796 9716
Fax	
Email address	bertrand.walle@gpn.fr
URL	http://www.gpn.fr
Representative	Bertrand WALLE
Title	Sustainable Development Manager
Mr/Mrs/Ms	Monsieur
Surname	Walle
Christian name	Bertrand
Service	
Mobile phone	
Fax (direct line)	
Phone (direct line)	+33 14796 9716
Personal email address	bertrand.walle@gpn.fr

Organisation	N.serve Environmental Services GmbH (Germany)
Street/P.O Box	Große Theaterstr.
Building	14
Town	Hamburg
Postcode	20354
Country	Germany
Telephone	+49 40 788937-08
Fax	+49 40 788937-10
Email address	contact@nserve.net
URL	http://www.nserve.net
Representative	Albrecht von Ruffer
Title	Managing Director
Mr/Mrs/Ms	Herr
Surname	von Ruffer
Christian name	Albrecht
Service	
Mobile phone	+49 (0)177 6515964

Fax (direct line)	+49 (0)40 3099786-11
Phone (direct line)	+49 (0)40 78893710
Personal email address	ruffer@nserve.net

Annex 2. Information concerning the application of the reference scenario methodology

Not applicable in the case of the application of a benchmark reference value for determining the project emissions reductions.

Annex 3. Information concerning the monitoring plan

Background on EN14181

The objective is to achieve the highest level of accuracy practically possible when conducting measurements and transparency in the evaluation process.

While EN14181 provides the most advanced procedures, its practical application is currently limited for the following reasons:

- Specific procedures for N_2O are not yet defined in EN14181;
- Only very limited experience exists with monitoring systems for N_2O emissions;
- In the context of conducting some of the calculations and tests of EN14181, no applicable N_2O-specific regulations exist in the EU (or elsewhere); and

Therefore, it is currently not possible to fully comply with EN14181 to the letter, neither in the EU, nor in a non-Annex 1 country to the Kyoto Protocol.

Despite all this, EN14181 provides very useful guidance in conducting a logical, step-by-step approach to selecting, installing, adjusting and operating the N_2O AMS for CDM and JI projects.

The monitoring procedures developed for this project aim at providing workable and practice-orientated solutions that take into account the specific situation at each nitric acid plant. Wherever possible, EN14181 is applied as guidance for the development and implementation of the monitoring procedures for this Projet Domestique in order to achieve highest possible measurement accuracy and to implement a quality control system that assures transparency and credibility.

Scope of EN 14181

This European Standard specifies procedures for establishing quality assurance levels (QAL) for automated measuring systems (AMS) installed at industrial plants for the determination of the flue gas components and other flue gas parameters.

This standard is designed to be used after the AMS has been accepted according to the procedures specified in EN ISO 14956 (QAL1).

EN14181 specifies:

- a procedure (QAL2) to calibrate the AMS and determine the variability of the measured values obtained, so as to demonstrate the suitability of the AMS for its application following its installation;
- a procedure (QAL3) to maintain and demonstrate the required quality of the measurement results during the normal operation of an AMS, by checking that the zero and span characteristics are consistent with those determined during the QAL1;
- a procedure for the annual surveillance tests (AST) of the AMS in order to evaluate (i) that it functions correctly and its performance remains valid and (ii) that its calibration function and variability remain as previously determined.

This standard is restricted to quality assurance (QA) of the AMS, and does not include the QA of the data collection and recording system of the plant.

For a full description of the AMS to be installed at the GPN Grandpuits nitric acid plant, as well as details on the quality assurance and control procedures to be undertaken, see section B.7.2 above.