
Project 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 Grand Quevilly N7 N₂O abatement project

Date: 6th August 2009

Version: 03

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

The sole purpose of the proposed project activity is to reduce levels of N₂O emissions from the production of nitric acid at GPN's N7 nitric acid plant at Grand Quevilly (near Rouen), France.

The nitric acid plant was designed by GPN. Commercial nitric acid production started in January 1989. It is a 5 bar medium pressure plant with a daily design production capacity of around 1,050 metric tonnes of HNO₃ (100% conc.) per day¹. The plant's design campaign length is approx 330 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 350 days per year resulting in a maximum annual production output of 367,500 tHNO₃.

To produce nitric acid, ammonia (NH₃) 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 NO₂, which is later absorbed in water to produce HNO₃ – nitric acid. Simultaneously, undesired side reactions yield nitrous oxide (N₂O), nitrogen and water. N₂O is a potent greenhouse gas with a Global Warming Potential (GWP) of 310². Without any N₂O abatement technology, the plant would emit an average of 7.78 kgN₂O / tHNO₃³, which means that the operation of the plant without any N₂O abatement technology installed would entail the emission of around 886,337 tCO₂e annually⁴.

The project activity involves the installation of a secondary N₂O abatement technology: a pelleted catalyst that is installed inside the ammonia oxidation reactor, underneath the

¹ All nitric acid quantities are provided in metric tonnes of 100% concentrated HNO₃, unless otherwise indicated.

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

³ N₂O concentration in the stack from the beginning of 2008 until the installation of secondary catalyst in June 2008 for a trial campaign showed an average concentration equal to approximately 7.78 kgN₂O/tHNO₃

⁴ This statement is based on the assumption of a yearly production of 367,500 tHNO₃ (1,050 t/day for 350 days / year).

precious metal gauzes. It is expected that this catalyst will reduce at least 80% of current N₂O emissions on average over its lifetime.

The N₂O abatement catalyst applied to the proposed project has been developed by YARA. Industrial trial runs have been undertaken at various YARA plants (mainly in France) over the last four years and one trial campaign has been conducted at GPN. By now, the technology is considered sufficiently mature for full application in nitric acid plants.

For monitoring the N₂O emission levels, GPN GQ N7 will install and operate an Automated Monitoring System in accordance with EU standards⁵.

GPN GQ N7 adheres to ISO9001 and ISO14001 management standards⁶ 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

⁵ See sections B.7.2 and Annex 3 for detailed information.

⁶ All quality management documents are stored on the internal database and will be made available to the AIEs upon request.

Region: North West (Haute Normandie), Département: Seine-Maritime

A.4.1.3. Commune

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Le Grand Quevilly (near Rouen)

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 N7 Nitric acid plant
30, rue de l'Industrie, BP 204.
GRAND QUEVILLY
76121
France

The picture below illustrates the location of the plant. The yellow pin is set at the tail gas stack and the ammonia burner is indicated by the red pin.



Figure 1: Location of GPN GQ N7 plant

Coordinates:

Plant absorption tower and tail gas stack:	Lat: 49°24'58.67"N
	Long: 1°1'28.92"E
Ammonia burner:	Lat: 49°24'59.60"N
	Long: 1°1'29.84"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 ammonia burner inside which the ammonia oxidation reaction takes place, the absorption tower where the gas mix from the burner is led through water in order to form nitric acid and the stack through which the off-gasses are vented into the atmosphere.

The precious metal gauze pack – i.e. the primary catalyst required for the formation of NO – has been manufactured by Heraeus in Germany for a number of years. The project activity entails the installation of:

- N₂O abatement technology, which is installed in the basket underneath the primary catalyst in the ammonia oxidation reactor; 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 N₂O 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 N₂O 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 N₂O emissions in France is a compulsory limit applying to nitric acid production on French territory of 7kgN₂O/tHNO₃ for all plants commissioned after February 1998⁷. However, due to lack of incentives for voluntary reductions before 2008⁸ and the general absence of more ambitious legal limits on industrial N₂O emissions in nearly all the European Union member states, the vast majority of EU-based plant operators have so far not invested in N₂O abatement devices.

In 2007, discussions in France were already at an advanced stage regarding the reduction of N₂O 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 2007'⁹ of the Ministère de l'Ecologie, de l'Energie, du Développement durable et de la Mer (MEEDDM). Since mid 2007 therefore, the potential opportunity to participate in a future Projet Domestique has provided a real incentive to consider installing some form of N₂O abatement catalyst.

⁷ 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 »

⁸ See decision 9/CMP.1, paragraph 5: "ERUs shall only be awarded for a Crediting Period after the beginning of 2008."

⁹ Published on the internet under

<http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000430873&dateTexte=>

However, GPN had serious reservations about installing N_2O abatement catalyst at its plants without some form of preliminary trial. Each nitric acid plant is very different from the next and each plant experiences different problems on catalyst installation. For example, it is very likely that the plant will encounter problems associated with pressure drop once the catalyst load is installed. 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 modifications will be needed to accommodate the increased load.

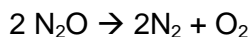
However, participation in the Projet Domestique offers a real incentive to install an abatement catalyst and to achieve the maximum emissions reductions possible. GPN therefore decided to conduct one trial campaign with the secondary catalyst in order to reassure themselves that there would be no negative technological effects on plant operation or nitric acid production. This preliminary trial, which started in June 2008, has been successful and is due to be completed at the end of the current production campaign in September. GPN is therefore now happy to make a full commitment to undertake a Projet Domestique at several of their plants and will therefore continue the operation of the catalyst from the beginning of the next production campaign in September for the full Projet Domestique period.



Figure 2: Installation of secondary catalyst

GPN N7 has chosen to install the YARA 58 Y 1® catalyst system, consisting of an additional base metal catalyst that is positioned below the standard precious metal gauze pack in the ammonia burner.

A secondary catalyst reduces N₂O 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 N₂O abatement catalysts. The YARA 58 Y 1® abatement catalyst is made of cylindrical pellets containing cobalt as an active ingredient. The abatement efficiency has been shown to be more than 80% in the following reaction:



If operated properly, the secondary catalyst system may significantly reduce N₂O emissions for up to three years before the catalyst material needs to be replaced.

The YARA 58 Y 1® abatement catalyst has been proven not to affect plant production levels¹⁰. Also, it does not contaminate the nitric acid produced in any way, neither with cobalt nor with any of the other catalyst materials¹¹. No additional heat or other energy input is required, because the temperature levels present inside the ammonia oxidation reactor suffice to ensure the catalyst's optimum abatement efficiency. There are no additional greenhouse gases or other emissions generated by the reactions at the N₂O abatement catalyst.

Basket modifications and Heat Shield design

Most nitric acid plants have some sort of basket structure that gives structural support to the precious metal gauzes. The ammonia oxidation reactor in the GQ N7 nitric acid plant normally operates at temperatures around 890°C, which causes the basket assembly to expand compared to when the plant is not operational (i.e. during installation of the catalyst).

This effect increases the basket diameter by 1 - 1.5%. The ammonia oxidation reactor of the N7 plant has a diameter of 4920 mm that therefore would expand by around 50- 75 mm when in operation. To counter this occurrence, a new basket has been installed to provide containment of the pelleted bed in a manner that prevents preferential gas flow at the circumference and to optimise the N₂O abatement efficiency of the catalyst.

N₂O abatement catalyst installation

The secondary catalyst itself is installed during a routine plant shut-down and gauze change. The pellets are poured into the support basket and levelled. The gauze pack is then installed above the levelled catalyst pellets.

After the end of its useful life, the catalyst will be refined, recycled or disposed of according to EU regulations, hence fulfilling sustainability standards.

¹⁰ 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 N₂O abatement catalysts.

¹¹ This has been proven in industrial testing. The underlying information is commercially sensitive and will be made available to the AIE mandated with the determination procedure upon request. 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 Inorganic Chemicals – Ammonia, Acids and Fertilizers (August 2007), page 124 therein (available for downloading under <http://eippcb.jrc.ec.europa.eu/pages/FActivities.htm>)

GPN GQ N7 nitric acid plant operates at a pressure of 5 bars inside the ammonia oxidation reactor. 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 industrial trials 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 N7 according to European industry standards¹². Due to the preliminary trial campaign with the catalyst, there are qualified personnel with the relevant know-how readily available within GPN. Therefore, 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 and regularly repeated 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. **Please note that all figures in the calculation tables have been rounded to the nearest tonne of CO₂e. In view of the fact 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 ₂ e
2009 (Dec only)	8,779
2010	105,350
2011	104,011
2012	47,318
Estimation of <u>total</u> emissions reductions over the crediting period (tonnes of CO ₂ e)	265,459

* 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.

¹² See section B.7.2 below.

The French Designated Focal Point (Le Ministère de l'Écologie, de l'Énergie, du Développement Durable et de l'Aménagement du Territoire (MEEDDAT)) 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 /t HNO_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

However, 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 16th July 2009, the local DRIRE (Directions Régionales de l'Industrie de la Recherche et de l'Environnement) introduced a plant-specific 'arrêté préfectoral', which will limit N_2O emissions at the GPN N7 plant to 2.47kg N_2O /t HNO_3 from July 2011 onwards.

Thus, since the regulatory N_2O emissions limit applied at N7 will be lower than the applicable benchmark value from July to end of December 2011, this regulatory limit shall serve as the basis for calculating the ERUs to be awarded for the project during those seven months. During that time the project proponents will therefore only receive ERUs for the difference between the applicable regulatory value of 2.47 kg N_2O /t HNO_3 and the emission levels of the project. For the year 2012, the project shall receive ERUs for the difference between the applicable benchmark value of 1.85 kg N_2O /t HNO_3 , as per the table above, 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 MEEDDAT.

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 N₂O 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 Directive¹³, the Linking Directive¹⁴ and various JI relevant decisions by EU bodies¹⁵. Besides acts of law of direct relevance, there also are Directives that have an indirect influence on JI implementation such as the IPPC Directive¹⁶.

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 2006'¹⁷ for the application of articles L. 229-20 to L. 229-24 of the 'code de l'environnement', and the 'Arrêté du 2 mars 2007'¹⁸ of the 'Ministère de l'écologie et du développement durable'.

¹³ 2003/87/EC, published on the internet under

http://ec.europa.eu/environment/climat/emission/implementation_en.htm

¹⁴ 2004/101/EC, published on the internet under

http://ec.europa.eu/environment/climat/emission/implementation_en.htm

¹⁵ 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

¹⁶ 2008/1/EC, published on the internet under

<http://ec.europa.eu/environment/air/pollutants/stationary/ippc/index.htm>

¹⁷ Published on the internet under

http://www.legifrance.gouv.fr/affichTexteArticle.do;jsessionid=85B1492FA603258E5FA3B94465CA21C1.tpdjo07v_2?cidTexte=JORFTEXT000000268218&idArticle=LEGIARTI000006251745&dateTexte=20060530&categorieLien=cid

¹⁸ Published on the internet under

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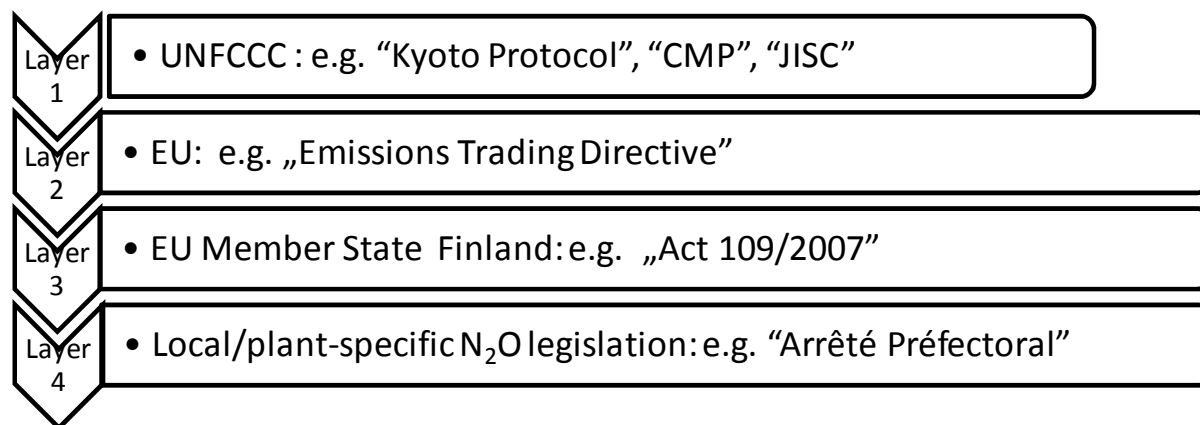


Illustration: Three layers of jurisdiction relevant for the implementation and subsequent operation of N₂O nitric acid JI projects in France

Applicability of Methodology «Catalytic reduction of N₂O at nitric acid plants»

The methodology for the reduction of N₂O emissions at nitric acid plants in France ("Catalytic reduction of N₂O at nitric acid plants") was approved by the MEEDDAT in July 2009 and is applicable to project activities aiming to install either secondary or tertiary N₂O abatement technology. The GPN GQ N7 plant consists of one ammonia burner feeding into one absorption tower, the off-gasses of which are emitted through one stack. The secondary N₂O catalyst system is inserted in the ammonia reactor 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 N₂O abatement devices already installed. Before the start of the project, GPN had installed secondary abatement catalyst for one production campaign in order to assess the potential technical problems that might be encountered before fully committing to installation of the catalyst for the next few years in the context of a Projet Domestique. This catalyst would be taken out at the end of this current campaign in the absence of a Projet Domestique.

Moreover, the project activity will not increase NO_x emissions. The secondary catalyst technology installed has no effect on NO_x emission levels. This has been scrutinised in industrial testing over extended industrial process application¹⁹. 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 burner and ends at the tail gas stack. Any form of NO_x-abatement device shall also be regarded as being within the project boundary.

¹⁹ 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 N₂O abatement catalysts.

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

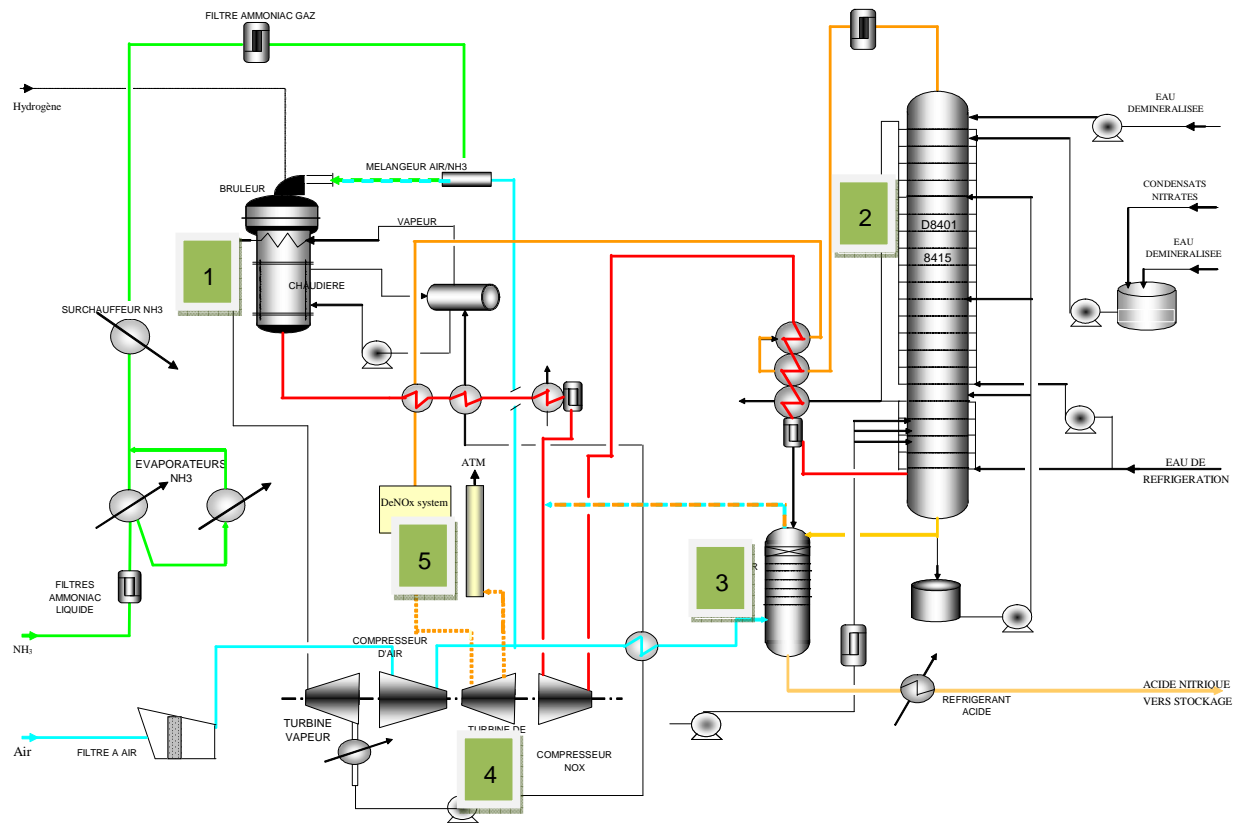


Illustration: Flow chart for the GPN Grand Quevilly N7 nitric acid plant.

- 1 = Ammonia oxidation reactor
- 2 = Absorption column
- 3 = SCR De-NOx reactor
- 4 = Tail gas turbine
- 5 = Tail gas stack

Source	Gas	Included ? (yes/no)	Justification / explication
Project Emissions	CO ₂	No	The project does not lead to any emissions of CO ₂
	CH ₄	No	The project does not lead to any emissions of CH ₄
	N ₂ O	Yes	
	others	N/A	

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 N₂O emissions. The principally debatable options are:

- a) Continuation of the *Status Quo*. The continuation of the current situation, where:
 - i) there is no N₂O destruction technology installed
 - ii) an N₂O 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 N₂O regulations.
- b) Alternative uses of N₂O, such as:
 - Recycling of N₂O for feedstock
 - External use of N₂O
- c) Installation of a Non-Selective Catalytic Reduction unit (NSCR)
- d) Implementation of a primary, secondary or tertiary N₂O destruction technology in the absence of the registration of the project activity as a *Projet Domestique*.

Assessment of the present situation, the “Status Quo”

In 2007, discussions in France were already at an advanced stage regarding the reduction of N₂O emissions at nitric acid plants for two potential reasons. The first was the possibility of the French nitric acid sector being ‘opted-in’ to the EU Emissions Trading Scheme in its second phase (2008 – 2012), and the second was the potential for French nitric acid plants to take part in JI projects under the Kyoto Protocol. Once the French government decided not to opt the nitric acid industry into the EU ETS, discussions focussed solely on the implementation of JI projects in France (*Projets Domestiques*). The rules and procedures for

such JI projects were already defined in March 2007 by the 'Arrêté du 2 mars 2007'²⁰ of the 'Ministère de l'Ecologie, de l'Energie, du Développement durable et de la Mer' (MEEDDM).

Since mid 2007 therefore, the potential to participate in a future Projet Domestique has provided a real incentive to consider installing some form of N₂O abatement catalyst.

However, as described in section A.4.2 above, GPN had serious reservations about installing N₂O abatement catalyst at its plants without some form of preliminary trial. GPN therefore decided to conduct one trial campaign with the secondary catalyst installed in order to assess the impact of the catalyst on the plant's operation. This preliminary trial has been successful and is due to be completed at the end of the current production campaign in September 2009. GPN is therefore now happy to make a full commitment to undertake a Projet Domestique and will therefore continue the operation of the catalyst from the beginning of the next production campaign in September for the full Projet Domestique period. However, in the absence of either a Projet Domestique or any applicable regulations limiting N₂O emissions at the plant, the catalyst would simply be removed at the end of this trial campaign.

GPN GQ N7 was issued in July 2009 with a plant-specific Arrêté Préfectoral by the local DRIRE (Directions Régionales de l'Industrie de la Recherche et de l'Environnement), which will impose a future N₂O limit of 2.47kg N₂O/tHNO₃ at the plant. However, in accordance with this Arrêté, the plant has a timeframe of 24 months to comply with the requirements of this regulation and so this limit will effectively only come into force from July 2011 onwards. This means that until that time, the only applicable N₂O emissions limit at the plant is an Arrêté Préfectoral issued in January 1989, which limits emissions to a maximum of 16kg N₂O/tHNO₃.

Given that the plant's emissions before the installation of the catalyst were on average around 7.78kg N₂O/tHNO₃, the plant is easily able to comply with this regulation without the aid of the abatement catalyst and therefore has no incentive or legal requirement to install N₂O abatement technology. For these reasons, and taking into account the expensive cost of secondary catalyst material and the potential technical problems that could arise at any time as a result of having a layer of secondary catalyst installed inside the burner (pressure drop, production loss, gas bypass etc), GPN would not continue to operate the catalyst after the end of the trial campaign. From July 2011 onwards, the plant would install just enough catalyst to comply with the regulatory requirement of 2.47kg N₂O/tHNO₃.

Reference case scenario a) i) can already be excluded from further assessment at this stage, since a batch of N₂O abatement catalyst has already been installed for a preliminary trial, as explained above.

The reference case 'business as usual' scenario would therefore be to remove the batch of catalyst at the end of the current production campaign, in the absence of either a more stringent regulatory N₂O emissions limit or the implementation of a Projet Domestique.

Alternative uses of N₂O

²⁰ Published on the internet under

<http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000430873&dateTexte=>

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.

The use of 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 N7 plant during standard operation without any abatement catalyst would be around 1245 ppmv²¹, 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 NSCR

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 minimum 500°C in order for the catalyst to function effectively.

Since GPN N7 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.

Implementation of primary, secondary and tertiary technologies

Since the primary catalyst composition is the most significant factor in determining nitric acid production efficiency and is carefully calculated to ensure a maximum production of HNO_3 at a minimum cost, producers are not willing to take any risks that may affect their nitric acid production by experimenting with different primary catalyst compositions to potentially influence N_2O levels. For the specific reduction of N_2O emissions, producers only consider installation of the already widely-tested and well-proven secondary and tertiary catalyst technologies.

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

N7 was issued in July 2009 with a plant-specific Arrêté Préfectoral by the local DRIRE, which will impose a future N_2O limit of 2.47kg $N_2O/tHNO_3$ at the plant. However, in accordance with

²¹ This value is derived from the average N_2O emissions readings taken at N7 from January to May 2008, prior to the trial catalyst installation

this Arrêté, the plant has a timeframe of 24 months to comply with the requirements of this regulation and so this limit will effectively only come into force from July 2011 onwards.

For the sake of clarification, the national N₂O regulation of 7 kgN₂O/tHNO₃ is not relevant in the context of this project, since this only applies to plants that were commissioned after 1998 (while N7 has been in operation since 1989).

In January 1989, when the plant was commissioned, the local DRIRE introduced a plant-specific 'Arrêté préfectoral', which limits N₂O emissions at the N7 plant to a maximum of 16kg N₂O/tHNO₃.

Considering the plant emissions in the absence of any abatement technology are proven to be around 7.78kg N₂O/tHNO₃, the operation of the plant without any N₂O abatement catalyst from the end of this campaign onwards would not be in conflict with any existing national or local regulations regarding N₂O emissions.

From July 2011, the business as usual scenario would be for GPN to install only as much secondary N₂O abatement catalyst as is necessary to ensure compliance with the applicable 'arrêté préfectoral'.

NO_x-emissions are also regulated by an 'Arrêté Préfectoral' issued by the local DRIRE for the GPN N7 plant. Currently, the permitted maximum level is 2.0kg NO_x/tHNO₃. The 'Arrêté Préfectoral' issued to N7 in July 2009 will limit NO_x emissions at the plant to 1.3kg/tHNO₃ from July 2011 onwards. The plant is comfortably in compliance with these requirements, since its average NO_x emissions in 2008 were 0.82kg NO_x/tHNO₃²².

GPN N7 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 authority²³.

Accordingly, the NSCR scenario alternative could be triggered by NO_x regulation. From this perspective, GPN N7 could be forced to reduce N₂O 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 N7 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, N7 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

²² Average NO_x emissions in 2008, based on monthly averages.

²³ DRIRE: Directions Régionales de l'Industrie de la Recherche et de l'Environnement

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;
 - Technical efficiency of the alternatives (i.e. destruction of N₂O, 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 N₂O destruction technology options (including NSCR) are expected to generate any significant financial or economic benefits other than JI related income. The N₂O 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 N₂O abatement (including NSCR) technology. See section B.4 step 2 for additional information on investment barriers facing NSCR technology. Since catalyst material is expensive and potential operational problems may occur with increased catalyst loads, installing and operating abatement catalyst is only made economically viable by means of Projet Domestique revenues.

The “Status Quo” scenario, the removal of the catalyst at the end of the current trial campaign, is considered not to face any significant investment barriers.

Technological barriers

All of the available N₂O abatement technologies have to be integrated in the nitric acid plant. Primary and 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 commissioning²⁴.

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).

Consequently, the scenario alternative "Status quo", the removal of the catalyst at the end of the current trial campaign, 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 N₂O emissions from nitric acid production may be included in the European Union Emissions Trading Scheme ("EU ETS")²⁵ or regulated otherwise. Both aspects theoretically could provide some incentive for developing N₂O abatement technology.

However, now that research and development has been completed and secondary catalyst technology is being employed successfully in many CDM and JI projects worldwide, plant operators would no longer be willing to incur the costs associated with the continued operation of such technology. For European nitric acid producers, the only incentive remaining to operate such technology to achieve maximum emissions reductions before the likely inclusion of N₂O emissions into the EU ETS from 2013 onwards 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 N₂O 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 proposal²⁶ upon reviewing the EU ETS that suggests that nitric acid N₂O should be covered in the scheme's third trading period, commencing in 2013.

²⁴ Also see footnotes 22 and 24 for further information and reference on NSCR technology.

²⁵ 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-CO₂ 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-CO₂ 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 N₂O emissions (see page 6 therein).

²⁶ See footnote 27

While some EU member states have chosen to 'opt-in' their nitric acid sector into the EU ETS,²⁷ 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 now looking at employing N₂O 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 reference scenario a) ii: the continuation of the current situation "Status Quo", where an N₂O abatement catalyst has already been installed for a preliminary technical trial, but where the catalyst would be removed at the end of this trial campaign in the absence of implementation of a Projet Domestique. From July 2011, just enough N₂O reduction catalyst would be installed in order to ensure compliance with the plant-specific N₂O regulatory limit of 2.47kg N₂O/tHNO₃.

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 N₂O-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 N₂O 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 "Arrêté du 2 Mars 2007" and described in the methodology "Catalytic reduction of N₂O 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

²⁷ Norway, the Netherlands, Austria and Italy

The installation of secondary N₂O abatement catalyst.

- 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

N₂O abatement catalyst has already been installed for a preliminary technical trial during one production campaign. However, this catalyst would be removed at the end of this trial campaign in September in the absence of the proposed project activity.

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 N₂O 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 N₂O 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 N₂O 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 N₂O at nitric acid plants” is therefore not applicable.

Barrier analysis: Step 3 of Section 3.2 of the methodology “Catalytic reduction of N₂O 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 N₂O 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 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 catalyst replacement during the project's lifetime (due to the gradual decrease of the catalyst efficiency) , GPN N7 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 currently has no need to make any further investment to decrease its N₂O emissions beyond the 16kg N₂O/tHNO₃ limit specified by the plant-specific 'arrêté préfectoral' currently in force. Emissions reductions from continued operation and replacement of the catalyst would be avoided in order to avoid extra costs.

None of the N₂O 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 N₂O in nitric acid plants" states "in the particular case of nitric acid plants, the N₂O tax²⁸ does not provide any incentive for the project participants to install N₂O 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:

With an additional bed of catalyst installed inside the ammonia burner, it is more likely 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. Revenues from the sale of ERUs provide the only incentive for the plant managers to confront this possible technical risk and operate the N₂O abatement catalyst.

- Common practice barriers :

Market studies (e.g. by EFMA, EU IPPC, US EPA, IPCC) show that N₂O abatement technologies are not yet 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 N₂O 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 N₂O emission caps. EU legislation initiating such a limit is under way already and will probably be introduced in the near future²⁹.

The proposed project activity is not common practice. Before now, with the exception of the 3 plants that have taken part in industrial trials, the common practice in the country is to operate such facilities without any N₂O abatement technology. This situation is now

²⁸ Payable in accordance with article 45 of the 'Loi de Finances 1999' and article 266 nonies of the 'Code des Douanes'

²⁹ See footnote 26 for detailed information.

changing, since other nitric acid plant operators in the region are also beginning to implement N₂O abatement technologies as project activities under the Projet Domestique.

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 N₂O emissions beyond the 16kg N₂O/tHNO₃ limit specified by the currently applicable plant-specific 'arrêté préfectoral'. 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 N₂O 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 "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, N₂O 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 kgN₂O/tHNO₃ – can be established at any given time for any period of time.

Higher N₂O 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 N₂O 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 times³⁰ that will become available to carbon markets.

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

Measuring of N₂O data sets for the calculation of project emissions

Throughout the project's crediting period, N₂O 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 N₂O 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) as recorded by the plant's process control system and the nitric acid production output (NAP_n) are required for calculating the project emissions.

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.

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, O₂ etc), a substitute value (C*subst) must be calculated for the hour in question, as follows:

$$C^*subst = C + \sigma C_{-}$$

where:

C: arithmetic mean of the concentration of the relevant parameter

³⁰ For the avoidance of doubt, ERU reductions for production periods with emission levels above the applicable Benchmark Emissions Factor DO NOT apply!

$\sigma C_{_}$: 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 N₂O concentration values recorded during periods where the N₂O concentration exceeds a value (expressed in mg/Nm³) equivalent to 2,5 kgN₂O/tHNO₃ (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".

However, in the case where a regulatory limit comes into force (as will be the case at GPN N7 from 16th July 2011 onwards), it must be proven during the verification to the satisfaction of the responsible AIE that no ERUs will be claimed for emission levels that exceed the new regulatory limit, which in this case will be 2.47kgN₂O/tHNO₃. It must therefore be proven at each verification that the plant's average emission levels for the past year did not exceed this regulatory limit.

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.

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 N₂O emissions. 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.

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 N₂O 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 N₂O 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:

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

The plant-specific project emissions factor representing the average N₂O emissions per tonne of nitric acid over the respective Verification Period is derived by dividing the total mass of N₂O emissions by the total output of 100% concentrated nitric acid for that period.

The average N₂O emissions per metric ton of 100% concentrated nitric acid for the Verification Period (PE_n) shall then be calculated as follows:

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

where:

Variable	Definition
PE _n	total specific N ₂ O emissions during the Verification Period (kgN ₂ O)
EF _n	Emissions factor used to calculate the emissions from the defined Verification Period n (kgN ₂ O/tHNO ₃)
NCSG _n	Mean concentration of N ₂ O in the tail gas stream during the Verification Period (mgN ₂ O/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 (or regulatory value, as applicable in accordance with section A.4.3 above) 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 N₂O, 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”.

$$ERU = ((EF_{BM}^{31} - EF_n)/1000 \times NAP_n \times GWP_{N_2O}) * 0.9 \quad (tCO_2e)$$

Where:

Variable	Definition
ERU =	Emission reductions awardable to the project for the Verification Period (tCO ₂ e)
NAP _n =	Nitric acid production for the Verification Period n (tHNO ₃).

³¹ Or EF_{reg}, as applicable in accordance with section A.4.3 above

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_{N_2O} = 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 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	<i>Global Warming Potential of N_2O</i>
Symbol	GWP_{N_2O}
Unit	tCO_2e/tN_2O
Source	<i>Climate Change 1995, The Science of Climate Change: Summary for Policymakers and Technical Summary of the Working Group I Report, page 22.</i>
Applicable value	310
Justification of choice of value	<i>To comply with the requirements of the Kyoto Protocol</i>
Comments	<i>310 until 31st December 2012 and 298 from 1st January 2013. Subject to revisions in accordance with Art. 5 Kyoto Protocol.</i>

Data / Parameter	<i>Specific reference value (benchmark emissions factor) that will be applied to calculate the emissions reductions from a specific Verification Period</i>
Symbol	EF_{BM}
Unit	$kgN_2O/tHNO_3$
Source	<i>Determined according to French government decision (MEEDDAT)</i>
Applicable value	<i>2.5kg $N_2O/tHNO_3$ until end 2011 and 1.85kg thereafter until end 2012</i>
Justification of choice of value	<i>Decision taken by the MEEDDAT in April 2009</i>
Comments	<i>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 MEEDAT.</i>

Data / Parameter	<i>Emissions cap for N₂O from nitric acid production set by government/local regulation</i>
Symbol	EF_{reg}
Unit	<i>kgN₂O/tHNO₃ (converted, if necessary)</i>
Source	<i>GPN N7 plant-specific 'arrêté préfectorals' issued by the DRIRE in Jan 1989 and July 2009</i>
Applicable value	<i>16 (applicable until July 2011) and 2.47 (applicable from July 2011 onwards) respectively</i>
Justification of choice of value	<i>Mandatory applicable limit</i>
Comments	<i>Continuous surveillance throughout crediting period.</i>

Table 5. Data and parameters determined prior to validation

Data / Parameter	<i>Ammonia Oxidation Temperature Trip Point Range</i>
Symbol	OT_{range}
Unit	°C
Source	<i>Plant operating manuals</i>
Applied value	<i>780 - 925</i>
Description of methods used to obtain this value (measurements, calculations, procedures etc)	<i>Value taken from plant operating manuals</i>
Comments	

Data / Parameter	<i>Maximum Ammonia to Air Ratio – trip point value</i>
Symbol	$AIFR_{max}$
Unit	%
Source	<i>Plant operating manuals</i>
Applied value	<i>13.4%</i>
Description of methods used to obtain this value (measurements, calculations, procedures etc)	<i>Value taken from plant operating manuals</i>
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 N₂O at nitric acid plants”, emission reductions are determined pro unit of product measured in metric tonnes of 100% concentrated nitric acid produced.

GPN GQ N7 has predicted the following production amounts³²:

Year	Expected production (tHNO ₃)
2009 (Dec only)	26,667
2010	320,000
2011	320,000
2012	320,000
Following years	320,000

Table 6: Budgeted nitric acid production

Based on these production figures, one can make assumptions on how much N₂O 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. The regulatory emissions factor of 2.47kgN₂O/tHNO₃ will come into force in July 2011 and will be applicable for calculating project emissions reductions from 1st July 2011 until 31st December 2011. This regulatory value is no longer relevant from 1st January 2012 in the context of calculating emissions reductions from the project, since the benchmark value imposed by the government in 2012 will be 1.85kgN₂O/tHNO₃, which is lower than the above regulatory value.

Estimated project emissions (compared to operation without N₂O 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 November 2009) or at the latest two months after submission of the Project Dossier applying for an LoA.
- GPN N7 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

³² Due to the uncertainty for nitric acid demand in the current climate, the estimated production has been calculated as an average for the annual production during the years 2005, 2006 and 2007. 2008 has been excluded from the calculation, due to an abnormally long shutdown for emergency repairs.

emissions from the plant without any abatement catalyst would be 7.78 kgN₂O/tHNO₃³³;

- The secondary catalyst employed performs with an average abatement efficiency of 83% throughout the project's lifetime (resulting in project emissions of 1.32kg N₂O/tHNO₃)³⁴;

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

Crediting Period Year	Project Emissions (tCO ₂ e)
2009 (Dec only)	10,912
2010	130,944
2011	130,944
2012	130,944
TOTAL (until 2012)	403,744

Table 7 (part A): Project emissions until 2012

Crediting Period Year	Project Emissions (tCO ₂ e)
2013	125,875
2014	125,875
2015	125,875
2016	125,875
2017	125,875
2018	125,875
TOTAL (over 10 year crediting period)	1,158,995
Average (over 10 year crediting period)	115,900

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

* Due to the likely inclusion of N₂O 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 N₂O 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 project³⁵, calculated reference emissions are represented through the value 2.5 kgN₂O/tHNO₃ until the end of -June 2011. Since the

³³ See footnote 3 for more detailed information

³⁴ Since the SCR de-NO_x catalyst unit at the end of the production process at GPN tends to generate some additional N₂O, 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 85%, measurements taken between June 2008 and March 2009, during the trial catalyst run, show that the additional N₂O generated by the de-NO_x unit results in a net reduction of approximately 83%, rather than 85%, of N₂O emissions.

regulatory value due to come into force at that time is lower than the applicable benchmark emissions factor, the regulatory value of 2.47 kgN₂O/tHNO₃ will represent the reference emissions between 1st July and 31st December 2011, while the benchmark value of 1.85kg kgN₂O/tHNO₃ 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 MEEDDAT during discussions in April 2009 as an example of a possible limit for N₂O emissions from 2013 onwards.

Crediting Period Year	Benchmark Scenario Emissions (tCO ₂ e)
2009 (Dec only)	20,667
2010	248,000
2011	246,512
2012	183,520
TOTAL (until 2012)	698,699

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

Crediting Period Year	Benchmark Scenario Emissions (tCO ₂ e)
2013	143,040
2014	143,040
2015	143,040
2016	143,040
2017	143,040
2018	143,040
TOTAL (over 10 year crediting period)	1,556,939
Average (over 10 year crediting period)	155,694

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

* Due to the likely inclusion of N₂O 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 N₂O 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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³⁵ See section A.4.3 (last paragraph) of the PDD for additional information.

Year	Estimate of project activity emissions (tonnes of CO ₂ e)	Estimate of Benchmark scenario emissions (tonnes of CO ₂ e)	Leakage estimate (tonnes de CO ₂ e)	10% deduction (tonnes de CO ₂ e)	Estimate of final emission reductions (tonnes of CO ₂ e)
2009 (dec only)	10,912	20,667	N/A	975	8,779
2010	130,944	248,000	N/A	11,706	105,350
2011	130,944	246,512	N/A	11,557	104,011
2012	130,944	183,520	N/A	5,258	47,318
Total (tonnes of CO ₂ e)	403,744	698,699		29,495	265,459

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	<i>Average N₂O concentration in the tail gas during project Verification Period n.</i>
Symbol	<i>NCSG_n</i>
Unit	<i>mgN₂O/Nm³</i>
Source	<i>Continuous Emissions N₂O Analyser (part of AMS)</i>
Measurement Frequency	<i>Hourly average value based on continuous monitoring</i>
Value applied for emissions reductions calculations in section B.6.	<i>Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.</i>
Applied measurement procedures	<i>Automatic continuous measurement with hot extractive analyser</i>
Applied quality assurance and control procedures	<i>AMS is subject to regular checking and calibrations that will take place according to vendor specifications and EN14181</i>
Comments	

Data / Parameter P.2	<i>Average Volume flow rate of the tail gas during project Verification Period n.</i>
Symbol	<i>VSG_n</i>
Unit	<i>Nm³/h</i>
Source	<i>gas volume flow meter (part of AMS)</i>
Measurement	<i>Hourly average value based on continuous monitoring</i>

Frequency	
Value applied for emissions reductions calculations in section B.6.	<i>Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.</i>
Applied measurement procedures	<i>Monitored continuously with flow meter</i>
Applied quality assurance and control procedures	<i>AMS is subject to regular checking and calibrations that will take place according to vendor specifications and EN14181</i>
Comments	<i>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.</i>

Data / Parameter P.3	<i>N₂O emissions during project Verification Period n.</i>
Symbol	<i>PE_n</i>
Unit	<i>kgN₂O</i>
Source	<i>Calculation from measured data</i>
Measurement Frequency	<i>Calculated after Verification Period has been defined by the project proponents</i>
Value applied for emissions reductions calculations in section B.6.	<i>Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.</i>
Applied measurement procedures	<i>Not applicable, calculated value as per the following formula: PE_n = VSG * NCSG * OH * 10⁻⁶</i>
Applied quality assurance and control procedures	<i>Not applicable</i>
Comments	

Data / Parameter P.4	<i>Total operating hours of Verification Period</i>
Symbol	<i>OH_n</i>
Unit	<i>Hours</i>
Source	<i>Production Log – taking into account the relevant trip point parameters</i>
Measurement Frequency	<i>Continuous</i>
Value applied for emissions reductions calculations in section B.6.	<i>Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.</i>
Applied measurement procedures	<i>Plant manager records the hours of full operation of the plant on a continuous Basis.</i>

Applied quality assurance and control procedures	<i>Not applicable</i>
Comments	<i>May be amended according to trip point values (see section B.6.1 above).</i>

Data / Parameter P.5	<i>Metric tonnes of 100% concentrated nitric acid during any Verification Period</i>
Symbol	<i>NAP_n</i>
Unit	<i>tHNO₃</i>
Source	<i>Nitric acid flow meter</i>
Measurement Frequency	<i>Continuously throughout the Verification Period</i>
Value applied for emissions reductions calculations in section B.6.	<i>Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.</i>
Applied measurement procedures	<i>Monitored with an electromagnetic flow meter</i>
Applied quality assurance and control procedures	<i>Checked during regular plant maintenance in accordance with the relevant quality assurance requirements.</i>
Comments	

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

Data / Parameter P.7	<i>Ammonia Flow rate to the ammonia oxidation reactor (AOR)</i>
Symbol	<i>AFR</i>
Unit	<i>kgNH₃/h</i>
Source	<i>Ammonia flow meter</i>
Measurement Frequency	<i>Hourly average value based on continuous monitoring</i>

Value applied for emissions reductions calculations in section B.6.	<i>Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.</i>
Applied measurement procedures	<i>Measured.</i>
Applied quality assurance and control procedures	<i>Checked during regular plant maintenance.</i>
Comments	

Data / Parameter P.8	<i>Ammonia to air ratio going into the ammonia oxidation reactor (AOR)</i>
Symbol	<i>AIFR</i>
Unit	<i>%</i>
Source	<i>Ammonia & Air flow meters</i>
Measurement Frequency	<i>Hourly average value based on continuous monitoring</i>
Value applied for emissions reductions calculations in section B.6.	<i>Not applicable. All ex ante emission reduction calculations in this PDD are based on estimated figures.</i>
Applied measurement procedures	<i>Monitored & calculated</i>
Applied quality assurance and control procedures	<i>Checked during regular plant maintenance.</i>
Comments	

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

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

Data / Parameter P.11	<i>Emissions factor calculated for project Verification Period n</i>
Symbol	<i>EF_n</i>
Unit	<i>$kgN_2O / tHNO_3$</i>
Source	<i>Calculated from measured data following procedures detailed in B.6.1</i>
Measurement Frequency	<i>After each Verification Period</i>
Value applied for emissions reductions calculations in section B.6.	<i>Estimated Project Emission factor is: 1.32 $kgN_2O/tHNO_3$ (based on 83% abatement efficiency from a level of 7.78kg prior to the installation of any catalyst)</i>
Applied measurement procedures	<i>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: $EF_n = (PE_n / NAP_n) \quad (kgN_2O/tHNO_3)$</i>
Applied quality assurance and control procedures	
Comments	
Data / Parameter P.12	<i>Emissions cap for N_2O from nitric acid production set by government/local regulation</i>
Symbol	<i>EF_{reg}</i>
Unit	<i>$kgN_2O / tHNO_3$ (converted if necessary)</i>
Source	<i>National or local N_2O emissions legislation</i>
Measurement Frequency	<i>After each Verification Period</i>
Value applied for emissions reductions calculations in section B.6.	<i>2.5kg to July 2011 and 2.47kg thereafter.</i>

Applied measurement procedures	<p>If this regulatory limit is LOWER than the applicable benchmark emissions factor, then EF_{reg} shall replace EF_{bm} in the calculation of ERUs:</p> $ERU = (EF_{reg} - EF_n)/1000 \times NAP_n \times GWP_{N_2O} \quad (tCO_2e)$
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 N₂O at 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 N₂O tax³⁶, 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"³⁷ as a guidance for installing and operating the Automated Monitoring System (AMS) at GPN N7 for the monitoring of N₂O 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 N₂O in the tail gas of the plant; and
- A gas volume flow meter that uses either differential-pressure or 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 N7 nitric acid plant.

³⁶ Payable in accordance with Article 45 of the Loi de Finances 1999 and Article 266 nonies of the Code des Douanes

³⁷ 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.

1. General Description of the AMS

For the purposes of the project activity the plant intends to install a state-of-the-art hot extractive AMS consisting of a Continuous Emissions Analyser, a sample probe, heated filter and heated sample-line connected directly to the analyser, as well as a stack gas volume flow meter. 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. The plant is currently equipped with a Finetech Orbital FTIR analyser that was installed in 2000 and is in compliance with the monitoring standards required by the methodology. It is possible that this analyser may be used for a short period at the beginning of the project activity, before the installation of the new equipment. During this period the stack gas flow will be calculated based on the primary and secondary air flow rates to the burner and the oxygen content in the tail gas, in accordance with the procedures outlined in section B.6.1. Although these procedures would not be fully in compliance with EN14181, they do indeed still fulfil the methodological requirements regarding monitoring standards (see paragraph 2, section 7 of the methodology).

Since this nitric acid plant has been in operation since 1989, GPN N7 staff in general, and its instrument department in particular, are accustomed to operating technical equipment adhering to high quality standards.

The following staff at the nitric acid plant will be responsible for the ongoing operation of the project and for the quality assurance and maintenance of the N₂O monitoring system:

Patrick le Calve	Plant Manager
Nicolas Aubertie	Head of Electrical Instrumentation Department
Pascal Fauquet	Analyser Engineer

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 N7 are also conducted and recorded in accordance with the procedures under ISO 9001 and ISO 14001, which is currently audited once every two years by a certified independent auditing organisation accredited for ISO 9001 and 1400 certification (APAVE).

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 N7 for the sample points for the measurement of N₂O [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

Discussions regarding the specific analyser to be ordered for the project are still ongoing, but the project proponents intend to install a hot-extractive Continuous Emissions Analyser that is capable of analysing N₂O concentration in gas mixtures. In the case where the chosen analyser cannot be proven to fulfil the requirements of QAL1, the suitability of the analyser for the project shall be proven 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 (and thus also QAL1), is not required by the methodology (see section 7 of the methodology 'Monitoring Plan' for full details).

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 the tail gas. For the purposes of complying with EN14181 during the project activity, a 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 N7 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. Martin Stilkenbäumer at N.serve is responsible for the correct data handling and processing.

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 N₂O 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 N7 nitric acid plant.

QAL 1

In accordance with EN14181, the selected AMS shall 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 shall perform all relevant tests on the AMS. The AMS has to be tested in the laboratory and field.

The chosen gas analyser should 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.

In the case where the chosen analyser cannot be proven to fulfil the requirements of QAL1, the suitability of the analyser for the project shall be proven 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 (and thus also QAL1), is not required by the methodology (see section 7 of the methodology ‘Monitoring Plan’ for full details).

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 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

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 N7 staff performs QAL3 procedures through the established calibration procedures described below.

AMS calibration and QA/QC procedures

The monitoring equipment used to derive the N₂O emissions data for this project will be made part of the ISO 9001 procedures.

N₂O-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).

N₂O-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 responsible

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The N₂O concentration in the stack that was measured over a period of 5 months from January 2008 prior to the installation of the N₂O abatement catalyst in June 2008, showed an average concentration equal to approximately 7.78 kgN₂O/tHNO₃.

This value of 7.78 kgN₂O/tHNO₃ 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 about 83%³⁸.

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 MEEDDAT 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 catalyst industrial test run will be completed at the end of the next production campaign in early September. The actual emissions reductions under the project activity will start from the beginning of the following campaign (expected mid September 2009).

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 MEEDDAT or b) from the date two months after submission of the full project documentation and request for LoA to the MEEDDAT, 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 end of November 2009.

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 3 years and 1 month (until the end of December 2012), since it is expected that N₂O emissions from HNO₃ plants will be covered by the EU ETS from 2013 onwards and that the project will no longer be viable³⁹. If this is not the case, and N₂O is not otherwise regulated in a way that prohibits the

³⁸ See footnote 36 for details

³⁹ See footnote 26

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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In accordance with the methodology "Catalytic reduction of N₂O 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 MEEDDAT or b) from the date two months after submission of the full project documentation and request for LoA to the MEEDDAT, 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 end of November 2009.

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 Project Domestic will be terminated earlier if there is a legal requirement to do so. All laws relevant for this project⁴⁰ 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 (N₂O) 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.

⁴⁰ See section B.1 above for more detailed information.

The N₂O abatement catalyst will be leased from a European supplier. The catalyst will be refined, recycled or disposed of in accordance with EU regulations, thus fulfilling sustainability standards.

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

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

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not applicable

SECTION E. Local Stakeholder Consultation

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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
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URL	http://www.gpn.fr
Representative	Thierry Kuter
Title	Purchasing Director
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Annex 2. Information concerning the application of the reference scenario methodology
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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 N₂O are not yet defined in EN14181;
- Only very limited experience exists with monitoring systems for N₂O emissions;
- In the context of conducting some of the calculations and tests of EN14181, no applicable N₂O-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 N₂O 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 N7 nitric acid plant, as well as details on the quality assurance and control procedures to be undertaken, see section B.7.2 above.

