

Projet Design Document (PDD)

This document must be completed without changing the format

SECTION A. General description of the project activity

A.1. Title of the project activity

GPN Grand Quevilly N8 N₂O abatement project

Dated: 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 N8 nitric acid plant at Grand Quevilly (near Rouen), France.

The nitric acid plant was designed by GPN. This is a new installation that started commercial nitric acid production in July 2009. It is a 4.4 to 5 bar medium pressure plant with a daily design production capacity of 1500 metric tonnes of HNO₃ (100% conc.) per day¹. The plant's design campaign length is 345 days. Depending on whether or not the plant is shut down for maintenance purposes or exchange of the primary catalyst gauzes, the plant can be operated for about 360 days per year, resulting in a nominal annual production output of 525,000 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, it is considered that the plant would emit an average of 7 kgN₂O / tHNO₃, which is based on the IPCC default value³ for nitric acid production from medium pressure plants⁴. This means that the operation of the plant without any N₂O

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 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Processes and Product Use, Chapter 3: Chemical Industry Emissions, paragraph 3.3.2.2, table 3.3. Available at: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/3_Volume3/V3_3_Ch3_Chemical_Industry.pdf

⁴ Although these IPCC values only apply to existing plants, there are currently no IPCC values recommended for new plants. This value is considered sufficiently conservative in the context of this project activity, since it is used only for estimating the project emissions factor and not as a basis for calculating the emissions reductions to be awarded

abatement technology installed would entail the emission of around 1,258,600 tCO₂e annually⁵.

The project activity involves the installation of a tertiary N₂O abatement technology: a pelleted iron-zeolite catalyst unit is installed in the same tail gas reactor as the separate De-NO_x catalyst (selective catalytic reduction of both N₂O and NO_x in distinctive catalyst beds). It is expected that this catalyst will reduce approximately 95% of the N₂O formed in the ammonia reactor.

The N₂O abatement catalyst applied to the proposed project has been developed by GPN.

For monitoring the N₂O emission levels, GPN GQ N8 will install and operate an Automated Monitoring System in accordance with EU standards⁶.

GPN GQ N8 adheres to ISO9001 and ISO14001 management standards⁷ 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	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)

⁵ Calculation based on the N₂O default value for medium pressure plants and the yearly production capacity of the plant (525,000 tHNO₃)

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

⁷ All quality management documents are stored on the internal database and will be made available to the AIEs upon request.

France

A.4.1.2. Region

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 N8 Nitric acid plant
30, rue de l'Industrie, BP 204.
GRAND QUEVILLY
76121
France

The picture below illustrates the location of the plant.

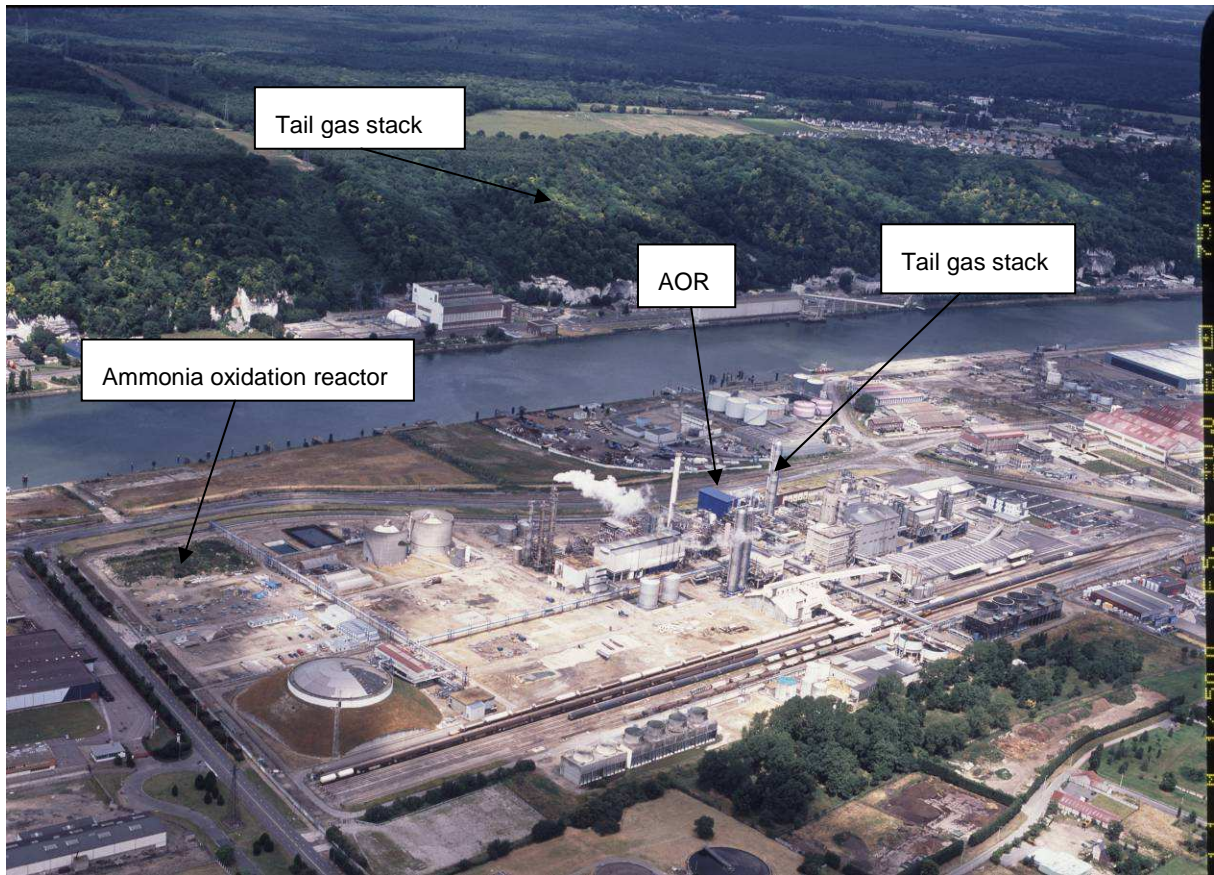


Figure 1: Location of GPN GQ N8 plant

Plant Coordinates:

Latitude: 49°25'2.31"N

Longitude: 1°1'28.38"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 – is manufactured by Johnson Matthey.

The project activity entails the installation of:

- N₂O abatement technology, which is installed directly above the de-NO_x catalyst bed within the same reactor between the final heat exchanger and the tail gas heat recovery unit ; and
- Specialised monitoring equipment that is 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 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 1998⁸. However, due to lack of incentives for voluntary reductions before 2008⁹ 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.

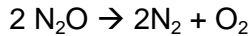
Participation in the Projet Domestique offers a real incentive to maximise the possible N₂O emissions reductions from the plant.

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

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

The tertiary catalyst system installed at GPN N8 consists of an iron-zeolite catalyst bed that is positioned directly above a standard de-NO_x catalyst bed, both of which are housed together in one reactor towards the end of the production process.

A tertiary catalyst reduces N₂O that was formed in 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 abatement efficiency of this iron-zeolite based pelleted catalyst has been shown to be about 95% in the following reaction:



This reaction is more effective in the presence of NO_x in the tail gas, hence the position of the N₂O abatement catalyst just upstream of the de-NO_x bed.

Before the tail gas enters the second catalyst bed, a small quantity of ammonia is injected for the purposes of catalytically reducing NO_x to nitrogen and water vapour over the second bed.

Since the system functions most effectively at temperatures greater than 420C, the tertiary reactor has been placed between the final heat exchanger and the tail gas turbine, where the tail gas temperature is around 420 - 430C.

As with all tertiary catalysts, the GPN-developed abatement catalyst cannot possibly affect plant production levels, since it is installed at the end of the production process, at a point downstream of the absorption column (in which the final stage of nitric acid production takes place). Also, it does not contaminate the nitric acid produced in any way, since the acid is formed and removed in the absorption column upstream of the tertiary destruction unit.

Project emissions (including any possible leakage emissions) due to the operation of a tertiary N₂O destruction facility will be addressed in sections B.6.1 and B.6.3 below.

N₂O abatement catalyst installation

The tertiary catalyst itself was commissioned together with the nitric acid plant in July 2009. After the end of its useful life, the catalyst will be disposed of according to EU regulations.

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), taking into account the Benchmark Emissions Factor and any applicable national or local N₂O regulations. **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)	23,755
2010	285,064
2011	285,064
2012	201,696
Estimation of <u>total</u> emissions reductions over the crediting period (tonnes of CO ₂ e)	795,579

* Due to the likely inclusion of N₂O emissions emanating from nitric acid production into the EU ETS from 1st January 2013 onwards, the project may not be eligible to earn ERUs after that time or continuing the project under the JI may not be economically viable.

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

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

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

Table 2: Applicable projet domestique benchmark emission factors (kg N₂O/tHNO₃)

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.

In accordance with the French methodology for Projets Domestiques "Catalytic reduction of N₂O at nitric acid plants", new installations replacing the capacity of older plants at which production has been discontinued, will also be eligible to receive ERUs for reductions below the above benchmark values, but only for the 'substituted' production from the plants that it replaces.

The methodology 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 the 4th March 2009, the local DRIRE (Directions Régionales de l'Industrie de la Recherche et de l'Environnement) introduced a plant-specific 'Arrêté Préfectoral', which limits N₂O emissions at the GPN N8 plant to 2.47kg N₂O/tHNO₃.

Thus, since the regulatory N₂O emissions limit applied at N8 is lower than the applicable benchmark values in years 2009 to 2011, this regulatory limit shall serve as the basis for calculating the ERUs to be awarded for the project during those three years. The project proponents will therefore only receive ERUs for the difference between the applicable

regulatory value of 2.47 kgN₂O/tHNO₃ and the emission levels of the project activity until the end of 2011. For the year 2012, the project shall receive ERUs for the difference between the applicable benchmark value of 1.85 kgN₂O/tHNO₃, as per the table above, and the emission levels of the project activity. These values have been taken into account in the above table.

The details of the applicable rules for substituted capacity for new installations and their implications on the project's operation will be dealt with in section B.6.3 below.

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 to the MEEDDM (including the PDD and preliminary Determination report), in order to request a Letter of Approval from France as the host country. The procedure for assessment of the project documentation by the MEEDDM should take a maximum of 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.

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 Directive¹⁰, the Linking Directive¹¹ and various JI relevant decisions by EU bodies¹². Besides acts of law of direct

¹⁰ 2003/87/EC, published on the internet under http://ec.europa.eu/environment/climat/emission/implementation_en.htm

¹¹ 2004/101/EC, published on the internet under http://ec.europa.eu/environment/climat/emission/implementation_en.htm

relevance, there also are Directives that have an indirect influence on JI implementation such as the IPPC Directive¹³.

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 2006'¹⁴ for the application of articles L. 229-20 to L. 229-24 of the 'code de l'environnement', and the 'Arrêté du 2 mars 2007'¹⁵ of the 'Ministère de l'écologie et du développement durable'.

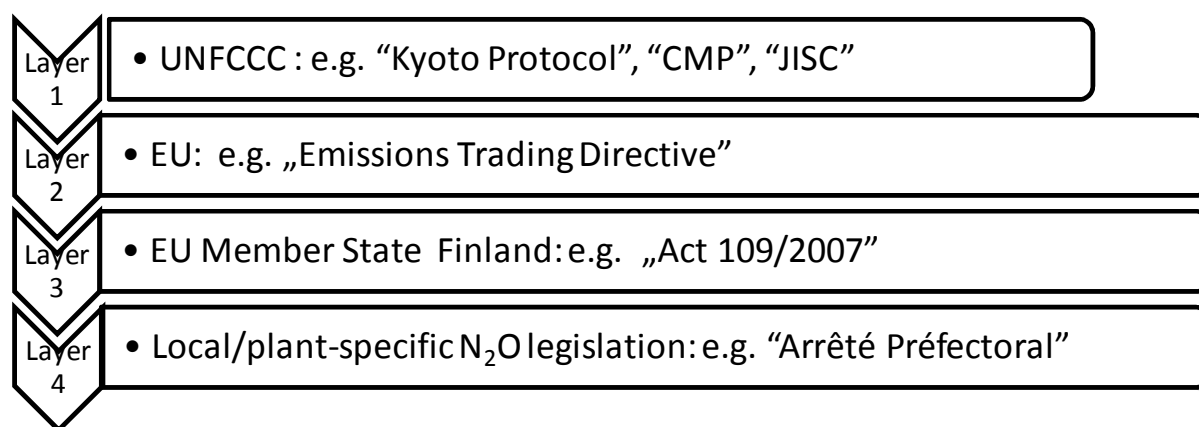


Illustration: Three layers of jurisdiction relevant for the implementation and subsequent operation of N₂O nitric acid JI projects in France

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 MEEDDM in July 2009. This methodology is applicable to project activities aiming to install either secondary or tertiary N₂O abatement technology. The GPN GQ N8 plant consists of one ammonia burner feeding into one absorption tower, the off-gasses of which are emitted through one stack. The tertiary N₂O catalyst bed is installed directly upstream of the NO_x abatement catalyst bed, both of which are housed in a reactor towards the end of the production process within the defined project boundary.

Moreover, the tertiary N₂O catalyst technology installed will have no effect on NO_x emission levels from the plant, since such catalysts are not known to produce or reduce NO_x as part of the N₂O abatement reaction. In any case, since NO_x limits have to be complied with, NO_x is

¹² 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

¹³ 2008/1/EC, published on the internet under <http://ec.europa.eu/environment/air/pollutants/stationary/ippc/index.htm>

¹⁴ Published on the internet under http://www.legifrance.gouv.fr/affichTexteArticle.do;jsessionid=85B1492FA603258E5FA3B94465CA21C1.tpdjo07v_2?cidTexte=JORFTEXT000000268218&idArticle=LEGIARTI000006251745&dateTexte=20060530&categorieLie n=cid

¹⁵ Published on the internet under <http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000430873&dateTexte=>

also regularly monitored and if indeed the NO_x emissions limits were to be exceeded due to the N₂O abatement catalyst, this would have to be modified to ensure compliance with NO_x regulations.

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 outlet of the tail gas stack. Any form of NO_x-abatement device shall also be regarded as being within the project boundary.

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

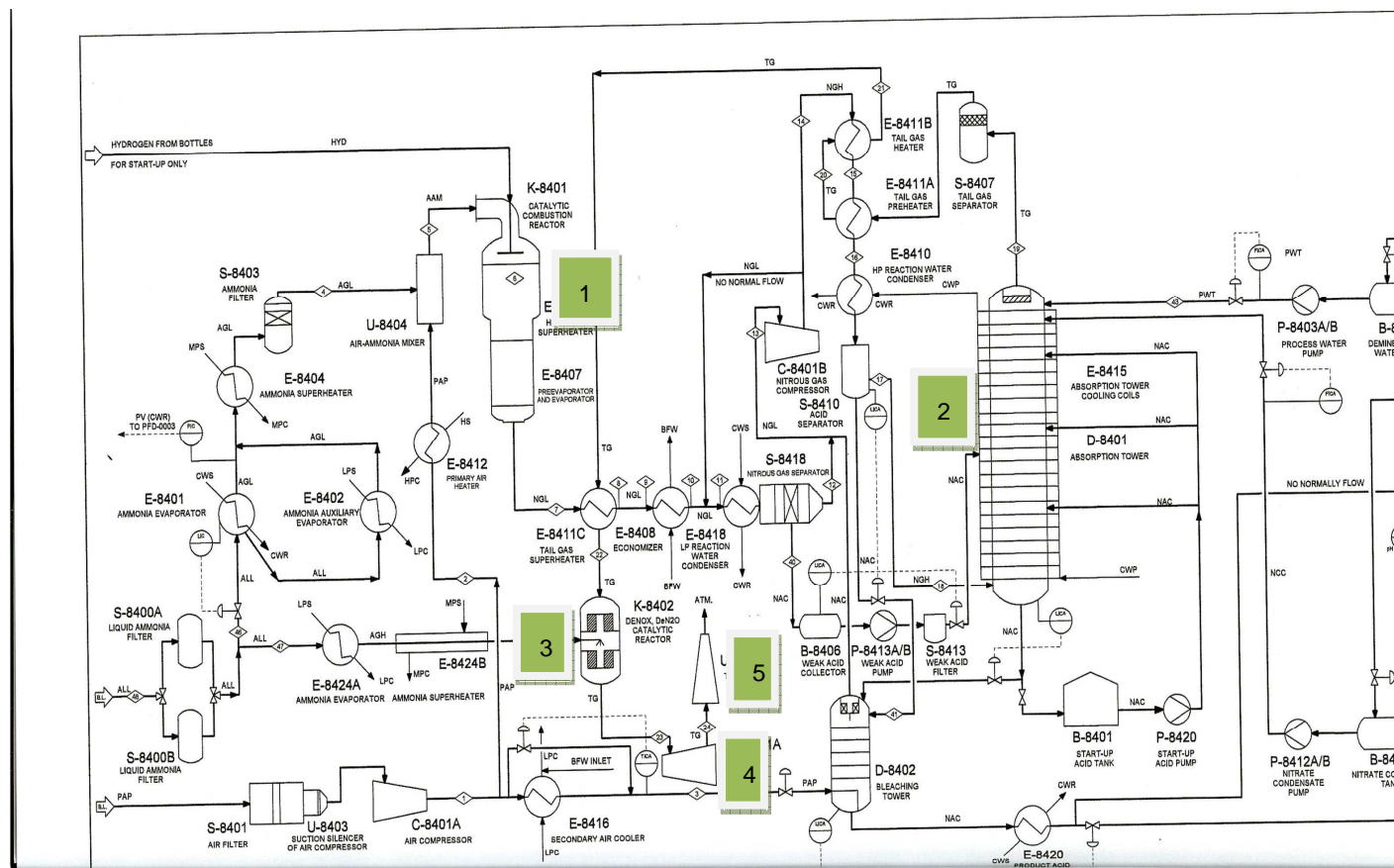


Illustration: Flow chart for the GPN Grand Quevilly N8 nitric acid plant.

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

Source	Gas	Included ? (yes/no)	Justification / explication
Emissions of N ₂ O as a result of side reaction to the nitric acid production process (project emissions)	N ₂ O	Included	Main emission source in tail gas after destruction facility
Emissions related to the production of ammonia ¹⁶ used for NO _x reduction (project emissions)	CO ₂ CH ₄ N ₂ O	Excluded in accordance with the applicable methodology	In accordance with the methodology, only those emissions related to the operation of the de-N ₂ O facility are to be taken into account.
Emissions at the project site resulting from hydrocarbons used as reducing agent and/or re-heating the tail gas (project emissions)	CH ₄ and/or CO ₂	Excluded	The technology applied to this project activity does not use hydrocarbons as a reducing agent or for increasing the tail gas temperature
Emissions related to the production of the hydrocarbons (leakage)	CO ₂ CH ₄ N ₂ O	Excluded	No hydrocarbons are involved in the operation of the destruction facility.

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:

¹⁶ Please note: Ammonia used for NO_x reduction does not cause GHG emissions. Only the production of NH₃ causes GHG emissions

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 (Business as Usual Scenario)*. The continuation of the business as usual scenario, where either:
 - i) there is no N₂O destruction technology installed
 - ii) only sufficient tertiary 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 'Business as Usual' scenario

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 in to the EU ETS, discussions focussed solely on the implementation of JI projects (*Projets Domestiques*) in France. The rules and procedures for such JI projects were already defined in March 2007 by the 'Arrêté du 2 mars 2007'¹⁷ of the 'Ministère de l'écologie et du développement durable'.

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.

Theoretically, in the absence of any regulation limiting N₂O emissions at its plant, GPN N8 could simply have decided not to install any N₂O abatement catalyst at its new plant. However, from March 2009, the local DRIRE (Directions Régionales de l'Industrie de la Recherche et de l'Environnement) introduced a plant-specific 'arrêté préfectoral', which limits N₂O emissions at the N8 plant to 2.47kg N₂O/tHNO₃.

In addition, any new plants being constructed in Europe will take into account during their planning phase that they will almost certainly be subject to very stringent N₂O and NO_x emissions regulations in the near future (most probably under the European ETS from 2013 onwards). The costs associated with installation of a tertiary N₂O and NO_x abatement reactor in an *existing plant* normally make such an installation extremely expensive: The plant needs to be modified significantly to allow for installation of a very large additional reactor and the

¹⁷ Published on the internet under <http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000430873&dateTexte=>

tail gas heating system of the plant often needs to be changed in order to pre-heat the gas to the necessary very high temperatures required for the tertiary catalyst to function. With a new plant however, these requirements can already be incorporated during the planning and design phase and the total cost of investment is lower.

As an additional precaution, to avoid any possibility of exceeding the regulatory limits during a technical malfunction of the tertiary catalyst, a secondary N₂O abatement catalyst support basket has also been installed in the ammonia oxidation reactor at N8. However, secondary catalyst would normally be leased from a supplier at a cost per tonne of HNO₃ produced each year, so these leasing costs would require continuous investment. In addition, the technical risks associated with the operation of a tertiary catalyst are generally considered lower than those of a secondary catalyst, since a tertiary is installed at the end of the production process, after the product nitric acid has been removed from the process flow and there is no possibility of interference in the process.

However, since the tertiary N₂O catalyst material itself is expensive, the reference case 'business as usual' scenario would be for the plant to install only just enough tertiary catalyst material in the de-N₂O bed to achieve compliance with the local 'Arrêté Préfectoral' on N₂O emissions.

Alternative uses of N₂O

The use of N₂O as a feedstock for the production of nitric acid is technically not feasible, because it is not possible to produce nitric acid from N₂O at the quantities found in the tail gas of nitric acid plants.

The use of N₂O for external purposes is not practised, 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 N₂O concentration in the tail gas of the N8 plant during standard operation without any abatement catalyst, in accordance with the IPCC default values for medium pressure nitric acid plants, would be around 1120 ppmv¹⁸, which is considered far too low to economically recover and separate N₂O from the tail gas.

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

Installation of NSCR

Although 'technically feasible', an NSCR de-NO_x catalyst unit is "not normally used in new plants"¹⁹. The EFMA BAT reference document²⁰ explains that an NSCR functions by injecting hydrogen, natural gas or hydrocarbons over a precious metal based catalyst, leading to high

¹⁸ This value is derived from the default values for medium pressure plants, as prescribed by the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Processes and Product Use, Chapter 3: Chemical Industry Emissions, paragraph 3.3.2.2, table 3.3. Available at: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/3_Volume3/V3_3_Ch3_Chemical_Industry.pdf

¹⁹ According to the Best Available Technique booklet for nitric acid plants, published by the European Fertilizer Manufacturers Association (EFMA). Other disadvantages of NSCR technology are also detailed here. This can be found on the internet under http://www.efma.org/EPUB/easnet.dll/ExecReq/Page?eas:template_im=000BC2&eas:dat_im=000EAE (see pages 17 & 18 therein for further information).

²⁰ See footnote 20

investment and operational costs. The use of hydrocarbons as a reducing agent also results in emissions of carbon monoxide, CO₂ 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 N8 already has a very efficient de-NO_x catalyst device installed within the tertiary reactor, 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 HNO₃ 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 N₂O levels. For the specific reduction of N₂O 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:

In March 2009, the local DRIRE introduced a plant-specific 'Arrêté préfectoral', which limits N₂O emissions at the N8 plant to 2.47kg N₂O/tHNO₃. This level does not represent the maximum N₂O reduction achievable. N₂O emissions could theoretically be lowered significantly below the stated value, using a tertiary catalyst. However, in order to minimise the costs, the business as usual scenario would be for GPN to install only as much tertiary 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 N8 plant. Currently, the permitted maximum level is 1.3kg NO_x/tHNO₃. The plant is comfortably in compliance with these requirements.

GPN N8 NO_x emissions will remain in compliance with the regulatory limit. This is safeguarded by the fact that NO_x emissions will be regularly reported to the responsible local environmental authority²¹.

The NSCR scenario alternative could theoretically be triggered by NO_x regulation. From this perspective, GPN N8 could be forced to reduce N₂O in a reference scenario if NO_x regulation forced the plant operators to install NSCR technology.

However, if even lower NO_x limits were to be introduced than are currently applicable, the most economical option would be to upgrade the existing NO_x abatement catalyst already installed at the plant in the tertiary reactor. However, N8 is currently achieving NO_x-emission levels significantly below the applicable limit so that such a scenario would be extremely unlikely.

²¹ DRIRE: Directions Régionales de l'Industrie de la Recherche et de l'Environnement

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

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

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

The identified barriers are:

- a) Investment barriers;
- b) Technological barriers, including :
 - Technical and operational risks of the alternative scenarios;
 - 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. These barriers would only be considered as overcome if there were a legal obligation to reduce N₂O emissions.

Since catalyst material is expensive, abating emissions to a level beyond that required for compliance with any legal N₂O limits is only made economically viable by means of Projet Domestique revenues. However, while any reference scenario alternatives that include the implementation of N₂O abatement catalysts would entail considerable investment barriers, the application of a mandatory 'arrêté préfectoral' by the local DRIRE from March 2009

onwards means that the “**Business As Usual**” scenario should not be interpreted to face such barriers. This is because the requirement to invest in some form of N₂O abatement technology at the plant is not connected to the proposed JI project activity.

Therefore, the “Business As Usual” scenario, the installation of just enough tertiary N₂O abatement catalyst to comply with the applicable N₂O regulation, 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, and some require an additional tail-gas pre-heating system.

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

However, due to the application of a mandatory ‘arrêté préfectoral’ by the local DRIRE from March 2009 onwards, the option of *not* installing some form of N₂O abatement device cannot be considered if nitric acid is to be produced at GPN.

Consequently, the scenario alternative “Business As Usual”, the operation of the plant with just enough tertiary N₂O abatement catalyst installed to comply with the applicable N₂O regulation, should be regarded as not facing any significant 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, N₂O abatement 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”)²² or regulated otherwise. Both aspects theoretically could provide some incentive for developing N₂O abatement technology.

²² 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

However, this research and development has been completed and N₂O abatement technology is being employed successfully in many CDM and JI projects worldwide. In the case where plants are subject to N₂O regulations and the installation of some catalyst is therefore unavoidable, plant operators would only be willing to incur costs associated with the operation of such technology in order to comply with these regulations – they would not be willing to incur the additional costs required to increase catalyst quantities and achieve the maximum abatement efficiency. The only incentive for European nitric acid producers to maximise the emissions reductions at their plants 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 proposal²³ upon reviewing the EU ETS that suggests that nitric acid N₂O should be covered in the scheme's third trading period, commencing in 2013. While some EU member states have chosen to 'opt-in' their nitric acid sector into the EU ETS,²⁴ 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.

JI N₂O reduction projects are currently being developed across the EU in Poland, Lithuania, Hungary, Bulgaria, France, Finland and Germany.

Conclusion

The only reference scenario alternative that is not prevented by any one of the barriers and that is in full compliance with the prevailing laws and regulations in France is the Business As Usual reference scenario, where **just** enough tertiary 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.

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).

²³ See footnote 23

²⁴ Norway, the Netherlands, Austria and Italy

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 Business as Usual 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

The installation of a full batch of tertiary N₂O abatement catalyst to maximise emissions reductions at the plant.

- 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 Business as Usual scenario

In the absence of the possibility to participate in a Projet Domestique, the plant would operate with tertiary N₂O abatement catalyst only partially installed to just achieve compliance with the plant-specific N₂O regulatory limit of 2.47kg N₂O/tHNO₃.

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 a full batch of tertiary 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 initial investment for the additional catalyst, GPN N8 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. Also, the catalyst material will have to be replaced approximately every three years if continuously low emissions are to be achieved, since the efficiency decreases during the catalyst’s lifetime.

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 would not be obliged to make any further investment to decrease its N₂O emissions beyond the 2.47kg N₂O/tHNO₃ limit specified by the plant-specific ‘arrêté préfectoral’. Surplus Emissions reductions beyond the regulatory limit through installation and replacement of full batches of tertiary 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 tax²⁵ 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:

²⁵ Payable in accordance with article 45 of the ‘Loi de Finances 1999’ and article 266 nonies of the ‘Code des Douanes’

In order to achieve the optimum abatement efficiency, a full batch of catalyst material will have to be installed in the catalyst vessel as opposed to a partial batch. Naturally this will lead to an increase in the pressure drop which in turn is more technically demanding on the compressor turbine at the inlet of the tail gas reactor vessel.

In addition, this compressor turbine is driven by steam which is generated by the plant itself. The higher demand of the compressor to counter the pressure drop from the full batch of catalyst installed requires more steam to drive the turbine, which in turn means that less steam can be exported.²⁶

- *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 future²⁷.

The proposed project activity would be the first time that a plant in France has attempted to fully maximise the reduction of N₂O emissions through the application of tertiary N₂O abatement catalyst. Before now, with the exception of the 3 plants that have taken part in industrial trials of secondary catalyst technology, the common practice in the country is to operate such facilities without any N₂O abatement technology.

Therefore, the analysis of the common industrial practice indicates that the proposed project activity is additional to the reference scenario.

Conclusion:

GPN would not be obliged to make any further investment to decrease its N₂O emissions beyond the 2.47kg N₂O/tHNO₃ limit specified by the 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 associated with the implementation of additional tertiary N₂O abatement catalyst under 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

²⁶ The net change in steam exported as a result of the additional catalyst installed has been calculated in the presence of the determining AIE and proven to be insignificant. In any case, this does not need to be taken into account in accordance with the leakage assessment of section 9 of the methodology (see 'leakage emissions' in section B.6 below for relevant leakage issues)

²⁷ See footnote 23 for detailed information.

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, 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 times²⁸ that will become available to carbon markets.

For these reasons, it is not relevant for which period of the plant's production cycle 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:

²⁸ For the avoidance of doubt, ERU reductions for production periods with emission levels above the applicable Benchmark Emissions Factor DO NOT apply!

- 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, O_2 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

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

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

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

ii. Other parameters

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

Data processing in case of malfunction of the abatement system

Section 4.5.2 of the methodology states: "in order to take into account problems that may occur with the catalyst system, 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 is in force (as is the case at GPN N8), 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 is 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 the trip point values for oxidation temperature and pressure and ammonia to air flow ratio. 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 (\bar{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 (EF_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	'Substituted' nitric acid production during the Verification Period (tHNO ₃)

Project emissions related to the operation of the tertiary N₂O destruction facility

The Projet Domestique Methodology "Catalytic reduction of N₂O at nitric acid plants" states: "If this methodology is to be applied to a project activity using tertiary catalyst, additional issues (such as the leakage of emissions) will be taken into account in accordance with the relevant section of this methodology". Section 9 of the methodology deals with project emissions from the operation of a tertiary N₂O destruction facility.

The emissions related to the operation of a tertiary N₂O destruction facility are given by (1) upstream emissions related to the production of ammonia used as input and (2) on-site emissions due to the hydrocarbons used as input to the N₂O destruction facility. However, these emission sources are only applicable to projects where additional ammonia and/or hydrocarbon input is required for the N₂O abatement part of the tail gas catalyst unit and, in accordance with section 9 of the methodology, they shall "not apply if additional ammonia and/or hydrocarbon is only required for the NO_x abatement section of the catalyst unit".

At GPN N8, the injection of NH₃ is only necessary for the effective operation of the NO_x abatement catalyst bed, while neither hydrocarbons nor ammonia are required as input for the operation of the N₂O abatement section. Therefore, in accordance with section 9, "Any emissions from the use of ammonia and/or hydrocarbons for the operation of the de-NO_x facility shall not be considered in the project activity".

Leakage emissions

In some cases when tertiary catalyst is installed, the heat balance of the plant has to be changed so that the tail gas temperature is increased to a level supporting the N₂O abatement process. If this increased heat is not recovered after the N₂O destruction facility, then there may be a case of leakage emissions from increased energy input into the process which is not recovered.

Section 9 of the methodology 'leakage' states: "If it can be demonstrated that the tail gas temperature after the N₂O destruction facility is similar to what it would be in a comparable nitric acid plant without such an N₂O destruction facility, then it is assumed that no leakage emissions do occur. For guidance, the usual range of tail gas temperatures in nitric acid plants in the gas stream after the final heat recovery system is between 70° and 170° C. Hence it is assumed that leakage only occurs in cases where the tail gas temperature after the final heat recovery system is on average above 170°C. In this case the appropriate section of the methodology "Leakage assessment" shall be applied".

In the case of GPN N8, the tail gas temperature after the final heat recovery system is a maximum of 150C, so it is assumed that no leakage emissions do occur.

In addition, section 9 of the projet domestique methodology "Catalytic reduction of N₂O at nitric acid plants" and the CDM methodology AM0028 for reduction of N₂O with a tertiary catalyst both state: "On condition that an energy converter (e.g. tail gas turbine) is installed at the end of the pipe, the installation of the N₂O destruction facility will not result in

significant additional energy consumption at the nitric acid production plant and therefore no leakage is expected. Leakage emissions need only be analyzed if the project activity does not involve any energy recovery from the tail gas”.

Although the requirement to conduct a leakage assessment has already been excluded by the fulfilment of the above temperature condition, the plant also has a tail gas expander turbine installed downstream of all other process equipment, including the N₂O destruction facility. This further serves to confirm that no leakage emissions do occur and a full leakage assessment is not required.

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 the applicable regulatory value (whichever is applicable in accordance with section A.4.3) and multiplying the result by the production output of 100% concentrated nitric acid over the period for which ERUs are to be claimed (see section B.6.3 for information on production capacity eligible for ERUs) 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”.

$$ERU = ((EF_{BM}^{29} - EF_n)/1000 \times NAP_n \times GWP_{N_2O}) * 0.9 \quad (tCO_2e)$$

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).
EF _{BM} =	Emissions Factor Benchmark according to host country approval (kgN ₂ O/tHNO ₃); see section A.4.3 of the PDD for further information.
EF _n =	Emissions factor used to calculate the emissions from the defined Verification Period n (kgN ₂ O/tHNO ₃).
GWP _{N₂O} =	Global Warming Potential : 310 tCO ₂ e/tN ₂ O

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

B.6.2. Data and parameters determined prior to validation

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²⁹ Or EF_{reg}, as applicable in accordance with section A.4.3 above

Table 4. Default factors

Data / Parameter	<i>Global Warming Potential of N₂O</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 N₂O/tHNO₃ 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	$kgN_2O/tHNO_3$ (converted, if necessary)
Source	<i>GPN N8 plant-specific 'arrêté préfectoral' issued by the DRIRE on 4th March 09</i>
Applicable value	2.47
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	840 - 920
Description of	<i>Value taken from plant operating manuals</i>

methods used to obtain this value (measurements, calculations, procedures etc)	
Comments	

Data / Parameter	<i>Ammonia Oxidation Pressure Trip Point Range</i>
Symbol	OP_{range}
Unit	<i>bar a</i>
Source	<i>Plant operating manual</i>
Applied value	<i>2.4 – 4.9</i>
Description of methods used to obtain this value (measurements, calculations, procedures etc)	<i>Value taken from plant operating manual</i>
Comments	

Data / Parameter	<i>Maximum Ammonia to Air Ratio – trip point value</i>
Symbol	$AIFR_{max}$
Unit	<i>%</i>
Source	<i>Plant operating manuals</i>
Applied value	<i>11</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.

However, in accordance with the French methodology “Catalytic Reduction of N₂O at Nitric Acid Plants”, a special requirement exists for assessing the quantity of production capacity of new plants that is eligible for receiving ERUs (the ‘substituted production’). The proponents

will only be awarded ERUs for emissions reductions corresponding to those specific production quantities from the new plant that directly substitute production capacity at old plants where production has been reduced or stopped. The 'substituted daily production' is defined as 90% of the nominal daily production capacity of 100% concentrated nitric acid of the old installation, or as 100% of the actual daily production capacity of the new plant if the latter is less than 90% of the nominal daily production capacity of the old installation.

The production capacity at GPN N8 is directly substituting the production from three older GPN plants that have recently been shut down - Oissel, Grand Quevilly N5 and Grand Quevilly N6. The following daily production capacities are to be reduced by 10% in accordance with the above requirement and compared to the production capacity of the new plant. The calculation for the issuance of ERUs will be based on the lower of the two production figures.

	Oissel	Grand Quevilly N5	Grand Quevilly N6	Total
design capacity (tHNO ₃ /year)	297,500	119,000	119,000	535,500
Total 'substituted' production eligible for ERUs	267,750	107,100	107,100	481,950

Table 6: 'Substituted production' of old installations

The design capacity of the N8 plant, which is 580,000tHNO₃/year, is to be compared with 90% of the 'substituted production' of the old installations, as calculated in table 6 above. Therefore, in accordance with the methodology, only 477,000t of the nitric acid produced by N8 each year would be eligible to receive ERUs from the project.

Year	Budgeted 'Substituted' production (tHNO ₃)
2009 (Dec only)	40,163
2010	481,950
2011	481,950
2012	481,950
Following years	481,950

Table 7: Budgeted 'substituted' nitric acid production capacity for which ERUs may be awarded

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, the benchmark values defined by the MEEDDAT would normally be applied for calculating the ERUs to be awarded to the project. However, since the regulatory N₂O emissions limit applied at N8 is lower than the applicable benchmark values in years 2009 to 2011, this regulatory limit shall serve as the basis for calculating the ERUs to be awarded for the project during those years. The project proponents will therefore only receive ERUs for the difference between the applicable regulatory value of 2.47 kgN₂O/tHNO₃ and the emission levels of the project activity until the end of 2011. For the year 2012, the project shall receive ERUs for the difference between the applicable benchmark value of 1.85 kgN₂O/tHNO₃ and the emission levels of the project activity.

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 or starting 2 months after the submission of the complete project dossier (PDD plus the draft determination report), whichever is the earlier (expected end November 2009)
- GPN N8 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. This is based on the IPCC default value³⁰ for medium pressure plants. Factual emissions from the plant without any abatement catalyst would therefore be around 7kgN₂O/tHNO₃³¹;
- The tertiary N₂O abatement catalyst performs with an average abatement efficiency of 95% throughout the project's lifetime (resulting in project emissions of 0.35kg N₂O/tHNO₃);

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

Crediting Period Year	Project Emissions (tCO ₂ e)
2009 (Dec only)	4,358
2010	52,292
2011	52,292
2012	52,292
TOTAL (until 2012)	161,232

Table 8 (part A): Project emissions until 2012

Crediting Period Year	Project Emissions (tCO ₂ e)
2013	50,267
2014	50,267
2015	50,267
2016	50,267
2017	50,267
2018	50,267
TOTAL (over 10 year crediting period)	462,837
Average (over 10 year crediting period)	46,284

³⁰ 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 3: Industrial Processes and Product Use, Chapter 3: Chemical Industry Emissions, paragraph 3.3.2.2, table 3.3. Available at: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/3_Volume3/V3_3_Ch3_Chemical_Industry.pdf

³¹ See footnotes 3 and 4 for more additional information

Table 8 (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 emissions

As mentioned above, since the regulatory N₂O emissions limit applied at N8 is lower than the applicable benchmark values imposed by the MEEDDM from 2009 to 2011, calculated reference emissions for those years must be represented through the regulatory emissions factor of 2.47 kgN₂O/tHNO₃.

The Benchmark Value of 1.85kg kgN₂O/tHNO₃ will be applied to calculate reference emissions from the 1st January until end of 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.

Crediting Period Year	Reference Scenario Emissions (tCO ₂ e)
2009 (Dec only)	30,752
2010	369,029
2011	369,029
2012	276,398
TOTAL (until 2012)	1,045,209

Table 9 (part A): Reference scenario emissions until 2012

Crediting Period Year	Reference Scenario Emissions (tCO ₂ e)
2013	215,432
2014	215,432
2015	215,432
2016	215,432
2017	215,432
2018	215,432
TOTAL (over 10 year crediting period)	2,337,799
Average (over 10 year crediting period)	233,780

Table 9 (part B): Hypothetic reference scenario 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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Year	Estimate of project activity emissions (tonnes of CO ₂ e)	Estimate of Benchmark scenario (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)	4,358	30,752	N/A	2,639	23,755
2010	52,292	369,029	N/A	31,674	285,064
2011	52,292	369,029	N/A	31,674	285,064
2012	52,292	276,398	N/A	22,411	201,696
Total (tonnes of CO ₂ e)	161,232	1,045,209		88,398	795,579

Table 10. 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 11 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>Finetech Orbital FTIR 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 Finetech Orbital FTIR 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	VSG_n
Unit	Nm^3/h
Source	<i>ultrasonic gas volume flow meter (part of AMS)</i>
Measurement Frequency	<i>Hourly average value based on a 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 continuously with a SICK MAIHAK FlowSick 100 ultrasonic 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	PE_n
Unit	kgN_2O
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	OH_n
Unit	<i>Hours</i>
Source	<i>Production Log – taking into account the relevant trip point parameters</i>
Measurement	<i>Continuous</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>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>Emerson Nitric acid coriolis 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</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>Oxidation Pressure</i>
Symbol	<i>OP</i>
Unit	<i>Bar a</i>
Source	<i>Pressure transmitter upstream of 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.8	<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.9	<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	<i>Monitored & calculated</i>

procedures	
Applied quality assurance and control procedures	<i>Checked during regular plant maintenance.</i>
Comments	

Data / Parameter P.10	<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.11	<i>Pressure of tail gas</i>
Symbol	<i>PSG</i>
Unit	<i>Pa</i>
Source	<i>Probe (part of the AMS 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.12	<i>Emissions factor calculated for project Verification Period n</i>
Symbol	<i>EF_n</i>

Unit	$kgN_2O / tHNO_3$
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: 0.35 $kgN_2O/tHNO_3$ (based on 95% abatement efficiency from a level of 7kg without 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.13	<i>Emissions cap for N_2O from nitric acid production set by government/local regulation</i>
Symbol	EF_{reg}
Unit	$kgN_2O / tHNO_3$ (converted if necessary)
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.	2.47kg
Applied measurement procedures	<i>If this regulatory limit is LOWER than the applicable benchmark emissions factor, then EF_{reg} shall replace EF_{bm} in the calculation of ERUs: $ERU = (EF_{reg} - EF_n)/1000 \times NAP_n \times GWP_{N_2O} \quad (tCO_2e)$</i>
Applied quality assurance and control procedures	
Comments	

B.7.2. Description of the monitoring plan

The emissions reductions achieved by the project activity will be monitored in accordance with sections 4, 5 and 6 of the projet domestique methodology "Catalytic reduction of N_2O at 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 tax³², always in their most up-to-date versions, including any applicable successor standards as valid at the time of project application). N.serve has chosen to use European Norm EN14181 (2004) "*Stationary source emissions - Quality assurance of automated measuring systems*"³³ as a guidance for installing and operating the Automated Monitoring System (AMS) at GPN N8 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 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 N8 nitric acid plant.

1. General Description of the AMS

The N8 plant at Grand Quevilly is equipped with a Finetech Orbital FTIR hot extractive AMS consisting of a Continuous Emissions Analyser, a sample probe, heated filter and heated sample-line connected directly to the analyser. An ultrasonic Sick Maihak FlowSick100 Stack Gas Flow meter is installed. 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 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

³² Payable in accordance with Article 45 of the Loi de Finances 1999 and Article 266 nonies of the Code des Douanes

³³ 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.

internationally relevant environmental standards, in particular EN 14181 (2004). Service will be performed by the supplier of the AMS.

All monitoring procedures at GPN are also conducted and recorded in accordance with the procedures under ISO 9001 and ISO 14001, which will be regularly audited by a certified independent auditing organisation accredited for ISO 9001 and 14001 certification (APAVE).

2. Sample points

The sample points are chosen in accordance with the AMS requirements, EN 14181 requirements and the plant design specifications to ensure optimum quality of the collected data. The sample points for the N₂O (NCSG) measurement are currently located at the base of the tail gas stack downstream of all process equipment, while the VSG (gas volume flow) measurement point is further downstream in the vertical section of the tail gas stack. To ensure homogeneity of gas flow at the sample points, it is recommended that there is an undisturbed straight length of pipe before the sampling points, of around 5 times the diameter of the stack.

3. Analyser

The Finetech Orbital FTIR Continuous Emissions Analyser is capable of analysing N₂O concentration in gas mixtures. It is an extractive, continuous measuring system and extracts a partial gas flow from the flue gas, which is led to the analyser through a heated line.

In the case where the chosen analyser cannot be proven to fulfil the requirements of QAL1, the suitability of this analyser for the project activity will be proven during the QAL2 audit by comparison with a Standard Reference Method, which will be performed by an independent laboratory with EN ISO/IEC 17025 accreditation. 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

The ultrasonic Sick Maihak FlowSick 100 measuring system allows continuous determination of the flow rate of stack gas and should 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 N8 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, as well as different status signals of the AMS and the trip point parameters (oxidation temperature and pressure, as well as ammonia and air flow rates) that define whether or not

the plant is in operation. 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 Stilkensäumer 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 have been adapted and are practically applied at the GPN N8 nitric acid plant.

QAL 1

In the case where the chosen analyser cannot be proven to fulfil the requirements of QAL1, the suitability of this analyser for the project activity will be proven during the QAL2 audit by comparison with a Standard Reference Method, which will be performed by an independent laboratory with EN ISO/IEC 17025 accreditation. 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. The QAL2 test will be conducted in October 2009.

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 N8 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 at least once per month (the calibration frequency might be adjusted if necessary).

N₂O-Analyser Span calibration

Manual span calibrations are done with certified calibration gas at least 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 at least 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 flow meter is 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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N₂O concentration at the N8 plant without any form of abatement catalyst is considered to be approximately 7kgN₂O/tHNO₃. This is based on the IPCC default value for medium pressure plants³⁴.

This value of 7kgN₂O/tHNO₃ has been used as a basis for calculating the expected project emissions factor that will result from the installation of the tertiary catalyst for the project activity, assuming an abatement efficiency of 95%.

However, due to the application of a benchmark emissions factor, 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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Under the Kyoto Protocol JI mechanism, Project Participants can claim Emission Reduction Units (ERUs) only for physical GHG reductions achieved after 1st January 2008.

The actual reduction of emissions began in July 2009 at the start-up of the N8 plant, with the N₂O abatement catalyst already installed.

However, 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 preliminary 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

³⁴ See footnotes 3 and 4 for more details.

covered by the EU ETS from 2013 onwards and that the project will no longer be viable³⁵. If this is not the case, and N₂O is not otherwise regulated in a way that prohibits the continuation of the project, the project's operational life will be 10 years in accordance with the crediting period specified in C.2.2 below.

C.2. Crediting Period

C.2.1. Date of commencement of the crediting period

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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 preliminary 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 Domestique will be terminated earlier if there is a legal requirement to do so. All laws relevant for this project³⁶ 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.

³⁵ See footnote 23

³⁶ See section B.1 above for more detailed information.

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

The catalyst material may need to be replaced during the project's lifetime and will be disposed of in accordance with EU regulations.

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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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.

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 N8 nitric acid plant, as well as details on the quality assurance and control procedures to be undertaken, see section B.7.2 above.

