PROJECT DESIGN DOCUMENT FORM
FOR CDM PROJECT ACTIVITIES (F-CDM-PDD)
Version 04.1

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	N_2O Emission Reduction in nitric acid plant Paulínia, SP, Brazil
Version number of the PDD	8 (updated due to renewal of crediting period)
Completion date of the PDD	13/01/2014
Project participant(s)	1. Rhodia Energy Brazil Ltda 2. Rhodia Energy 3. Rhodia Energy GHG 4. ORBEO 5. Rhodia Energy GHG SAS
Host Party(ies)	Brazil
Sectoral scope and selected methodology(ies)	Category 5: Chemical Industry “Large-scale Consolidated Methodology - N2O abatement from nitric acid production (ACM0019 - Version 02.0)”
Estimated amount of annual average GHG emission reductions	**71,364 tCO_2e**

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Description of the project activity

Nitrous Oxide (N_2O) is an undesired by-product gas from the manufacture of nitric acid. Nitrous oxide is formed during the catalytic oxidation of Ammonia. Over a suitable catalyst, typically 90-99 % of the fed Ammonia is converted to Nitric Oxide (NO). The remainder participates in undesirable side reactions that lead to the production of Nitrous Oxide, among other compounds.

Waste N_2O from nitric acid production is typically released into the atmosphere, as it does not have any economic value or toxicity at typical emission levels. N_2O is an important greenhouse gas which has a high Global Warming Potential (GWP) of 298.

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

Rhodia has a plant at PAULÍNIA, state of São Paulo, Brazil, that manufactures nitric acid from ammonia. This nitric acid is used for the production of adipic acid also in Paulinia plant.

The waste gas stream from the nitric acid unit goes through a Selective Catalytic Reduction process (by introduction of ammonia) to destroy the NO_x gases (NO, NO_2, N_2O_3, N_2O_4). Nitrous oxide remains unchanged through that treatment and is released with the off gases to the atmosphere. The NO_x emissions from the plant meet the current Brazilian regulation.

The installation of the decomposition device enables Rhodia Poliamida e Especialidades Ltda and Rhodia Energy GHG to reduce N_2O emissions (GHG emissions), which would in the absence of the project activity have been vented to the atmosphere. The installation of the decomposition device makes Rhodia Poliamida e Especialidades Ltda contribute to sustainable development by restricting the release of GHGs.

The baseline scenario

The baseline scenario continues to be the scenario existing prior to the implementation of the project.

The baseline scenario is determined to be the release of N_2O emissions to the atmosphere.

The emissions from the plant met the Brazilian regulation.

Description of how the project activity contributes to sustainable development

The installation of the secondary catalyst enables the project participant to avoid N_2O emissions (GHG emissions). The installation of the decomposition facility not only contributes to sustainable development by restricting the release of GHGs but also gives economic and technical benefits to the country by providing direct and in-direct employment and transfer of technology from Europe.

Estimate of annual average and total GHG emission reductions for the second crediting period

The estimate annual average and total GHG emission reductions for the second crediting period are:

71,364 t CO_2e

A.2. Location of project activity

A.2.1. Host Party(ies)

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The Federative Republic of Brazil

A.2.2. Region/State/Province etc.

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State of São Paulo

A.2.3. City/Town/Community etc.

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Paulínia

A.2.4. Physical/Geographical location

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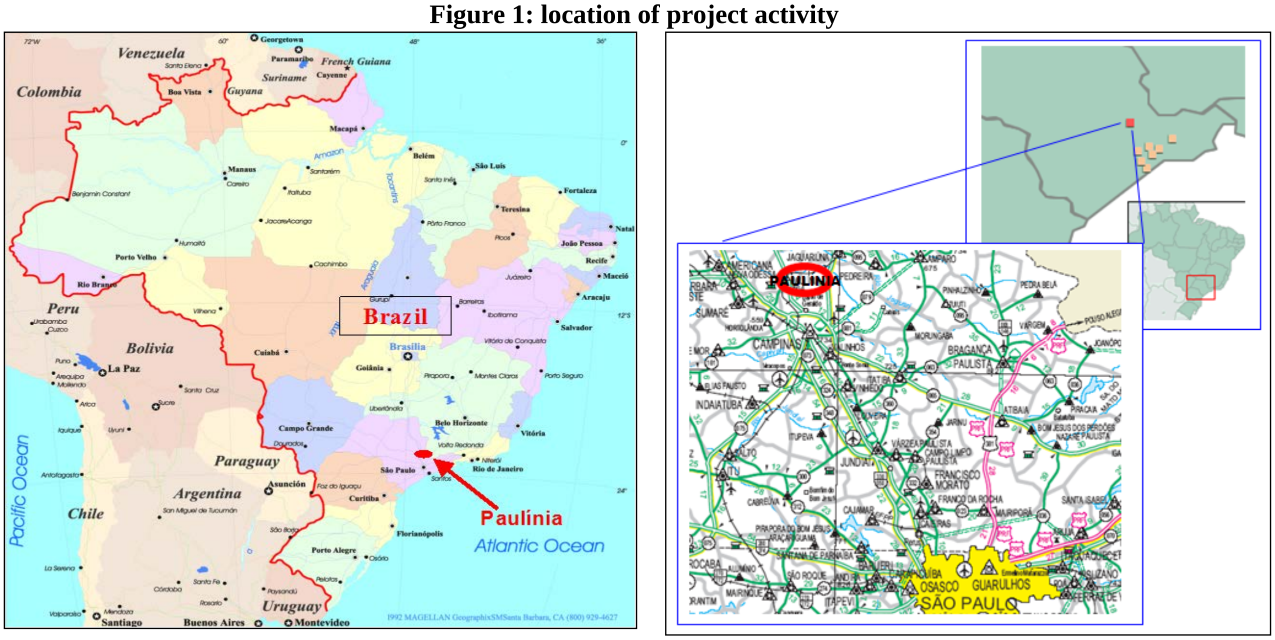
The project is situated in the area of the city Paulínia, Brazil. Paulínia is located in the northeast region of São Paulo State, 118 km from São Paulo city. The area surrounding the town of Paulínia is largely industrialized comprising the biggest oil refinery in Brazil and many chemical, fertilizer, textile, pharmaceutical, electronic and automobile industries. The project activity is located about 9 km away from the city of Paulínia with GPS coordinates: -22.753695 -47.108892. The physical location of the project is shown below.

Figure 1: location of project activity



A.3. Technologies and/or measures
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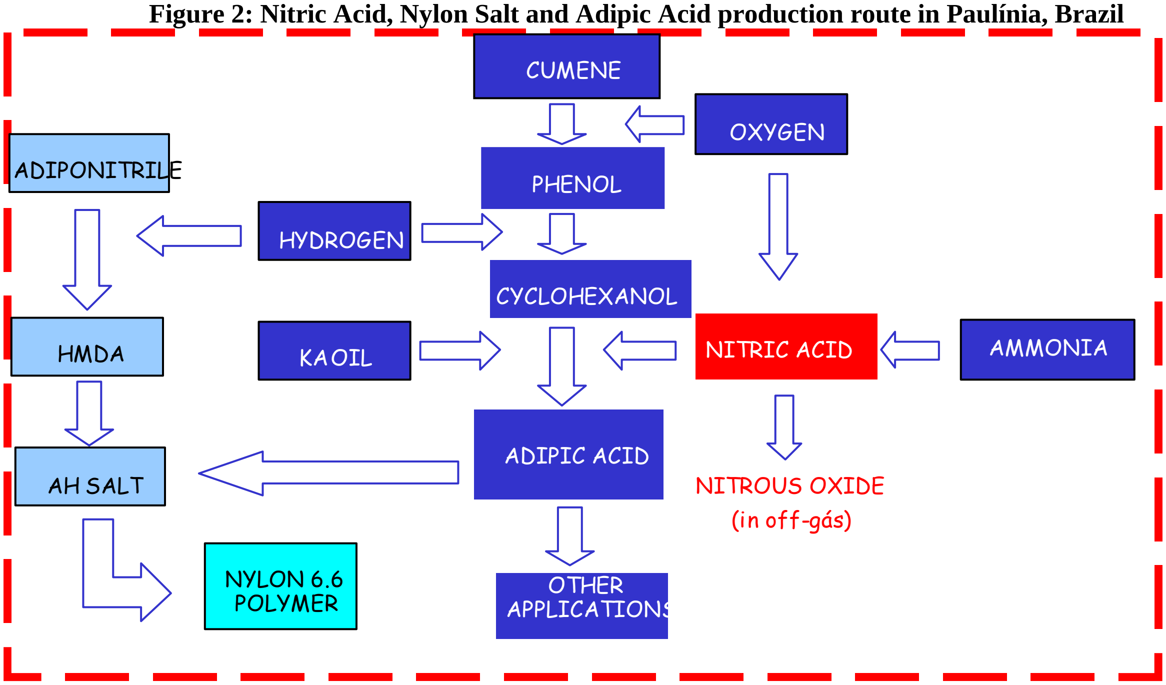
Figure 2: Nitric Acid, Nylon Salt and Adipic Acid production route in Paulínia, Brazil



In the nitric acid manufacturing process N_2O is inevitably generated as a by-product (see Figure 2).

The basic Ostwald process involves 3 chemical steps:

A) Catalytic oxidation of ammonia with atmospheric oxygen, to yield Nitrogen Monoxide (or Nitric Oxide).
(1) $4\ NH_3 + 5\ O_2 \rightarrow 4\ NO + 6\ H_2O$

B) Oxidation of the Nitrogen Monoxide to Nitrogen Dioxide or Dinitrogen Tetroxide
(2) $2\ NO + O_2 \rightarrow 2\ NO_2 \leftrightarrow N_2O_4$

C) Absorption of the Nitrogen Oxides with water to yield Nitric Acid
(3) $3\ NO_2 + H_2O \rightarrow 2\ HNO_3 + NO$

Reaction 1 is favoured by lower pressure and higher temperature. Nevertheless, at too high temperature, secondary reactions take place that lower yield (affecting nitric production); then, an optimal is found between 850-950 °C, affected by other process conditions and catalyst chemical composition.

Reactions 2 and 3 are favoured by higher pressure and lower temperatures.
The way in which these three steps are implemented, characterizes the various Nitric Acid processes found throughout the industry. In single pressure (our case) processes ammonia combustion and nitrogen oxide absorption take place at the same working pressure. In dual pressure or split pressure plants the absorption pressure is higher than the combustion pressure.

Nitrous Oxide formation

Nitrous oxide is formed during the catalytic oxidation of Ammonia. Over a suitable catalyst, typically 90-99% of the fed Ammonia is converted to Nitric Oxide (NO) according to reaction (1) above. The remainder participates in undesirable side reactions that lead to Nitrous Oxide (N_2O), among other compounds.

Possible side reactions during oxidation of Ammonia:
(4) $4\ NH_3 + 4\ O_2 \rightarrow 2\ N_2O + 6\ H_2O$ (Nitrous Oxide formation).
(5) $4\ NH_3 + 3\ O_2 \rightarrow 2\ N_2 + 6\ H_2O$
(6) $2\ NO \rightarrow N_2 + O_2$
(7) $4\ NH_3 + 6\ NO \rightarrow 5\ N_2 + 6\ H_2O$

There is no Brazilian governmental regulation which restricts N_2O emissions. Consequently, before the installation of the secondary catalyst, the N_2O was emitted to the atmosphere as there is no economic incentive from the Brazilian Government to prevent its release.

Types and levels of services provided by systems installed under the project activity
The N_2O decomposition process is the type of service provided by the project.

Decomposition process description
General description
The current project activity involves the installation of a new (not previously installed) catalyst below the oxidation gauzes (a "secondary catalyst") whose sole purpose is the decomposition of N_2O. The secondary approach has, for our Paulinia Plant, the following advantages:

- The catalyst does not consume electricity, steam, fuels or reducing agents (all sources of leakage) to eliminate N_2O emissions; thus, operating costs are the cost of the catalyst itself and the overall energy balance of the plant is not affected.
- Installation is extremely simple and does not require in our case any new process unit or re-design of existing one. The investment consists in the implantation of the measurement equipment (analyser, flow meter).
- Installation is also very fast, so it is done simultaneously with a primary gauze changeover; thus, our plant has no loss in production due to incremental down time.
- Considerably lower capital cost when compared to other approaches.

The selected technology has been developed by many catalyst developers. All of them have been developing solutions for a "secondary" catalyst that decomposes N_2O without affecting Nitric Acid production. Typically the catalyst has a very high activity for N_2O decomposition; in a typical medium pressure plant. Basically, high level (more than 80%) of N_2O abatement can be reached.

Some advantages specific to the selected secondary catalyst are:

- No measurable effect on ammonia to nitric oxide yield.
- Low level of N_2O in tail gas is achievable by adjusting the catalyst bed thickness.
- Proven performance.

To create space to insert the new catalyst, enough layers of Raschig rings was removed from the basket. Once the secondary catalyst is installed, the primary gauzes are placed on top of the basket, as usual. Then, the secondary catalyst acts as support system for the primary gauze pack and both catalysts are in close contact.

The chosen N_2O abatement catalyst vendor is obliged by Rhodia Poliamida e Especialidades Ltda to take back the catalyst at the end of their useful life and refine, recycle or dispose of them according to the prevailing EU standards and hence fulfil sustainability standards.

Under business-as-usual conditions the proposed decomposition device would not be installed for the following reasons:

(1) At present there are no quantified governmental effluent controls or obligations to reduce emission of N_2O in Brazil, as N_2O does not have any negative effects on the local environment. It is unlikely that any such limits on emissions would be imposed in the near future. However, the baseline methodology applied continuously monitors whether a regulation on N_2O emissions will be introduced and adjusts the baseline immediately if this is the case.

(2) Installation of the N_2O decomposition device requires investment and operational costs without additional economic benefits. The N_2O flow contains impurities and has variable concentration that would imply complex purification and concentration units in order to produce potentially marketable N_2O. The feasibility of using the nitric acid off gas containing N_2O as a feedstock for the petrochemical industry has not been demonstrated. Thus, there are no commercial incentives for Rhodia Poliamida e Especialidades Ltda. to set up any decomposition device at present and in the future, as long as domestic regulation governing emission limits does not exist.

Thus, under business-as-usual all N_2O generated by the nitric acid production would be emitted to the atmosphere during the foreseeable future. The net emissions of GHGs from the Paulínia nitric acid facility will therefore be reduced by this decomposition process.

There are certain GHG emissions due to the project activity inside and outside of the project boundary.
Inside the project boundary GHG emissions occur because the decomposition device will not be capable of decomposing 100% of the incoming N_2O

Services provided by manufacturing/ production systems/ equipment outside project boundary

- The plant exists in Paulínia since 1969 and has undergone several extensions with its current nameplate capacity established in 2005.
- The CDM project is applied only for the installed capacities of the plant (measured in tonnes of nitric acid per year) that exist before project implementation. The current nameplate capacity of our plant established in 2005 is 55,900 t of HNO_3 / year

Description of how services provided by the project would have been provided in baseline
In the baseline scenario no N_2O emissions would have been reduced at Paulínia nitric acid plant. In the baseline scenario all N_2O would have been emitted to the atmosphere as there is no economic incentive to prevent its release.

Facilities, systems, equipment in operation prior to implementation of project activity
This is not applicable since there was no equipment in operation prior to implementation of the project.

List of facilities, systems, equipment in baseline scenario (if different to prior scenario)
As shown in section B.4 the baseline scenario continues to be the scenario existing prior to the implementation of the project.

Description of how technology, measures, know-how were transferred to host country
The installation of the secondary catalyst technology enables economic and technical benefits to the host country by providing direct and in-direct employment and transfer of secondary catalyst technology from Europe.

A.4. Parties and project participants

Party involved (host) indicates a host Party	**Private and/or public entity(ies) project participants (as applicable)**	**Indicate if the Party involved wishes to be considered as project participant (Yes/No)**
Brazil (host)	Private entity : Rhodia Energy Brazil Ltda	No
France	Private entity : Rhodia Energy	No
	Private entity : Rhodia Energy GHG	No
	Private entity : ORBEO	No
Switzerland	Private entity : Rhodia Energy GHG SAS	No

A.5. Public funding of project activity
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No public funds are used.

SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

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- **Large-scale Consolidated Methodology "N_2O abatement from nitric acid production" (ACM0019, V 02.0)**[1]
- CDM validation and verification standard (V05.0 / : section "Renewal of crediting period")[2]
- CDM project standard (v05.0 / section "Renewal of crediting period of project activities")[3]
- Methodological Tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (V 03.0.1 / EB 66 Annex 47)[4]
- Tool to determine the mass flow of a greenhouse gas in a gaseous stream (V 02)[5]
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (V 02)[6]

B.2. Applicability of methodology

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The methodology chosen in section B.1 is applicable to the project activity as shown below.

	Applicability condition	Condition fulfilled?	Justification[7]
a)	In the case that the nitric acid plant started commercial operation before the implementation of the CDM project activity, the project participants shall demonstrate that there was no secondary or tertiary N_2O abatement technology installed in the respective nitric acid plant;	**Yes**	• The nitric acid plant started commercial operation in 1969, prior to the implementation of the project activity. • No secondary or tertiary N_2O abatement technology was installed in the nitric acid plant previous to the implementation of the CDM project activity.
b)	Continuous real-time measurements of the N_2O concentration and the total gas volume flow can be carried out in the tail gas stream after the abatement of N_2O emissions throughout the crediting period of the project activity;	**Yes**	• Since the beginning of the first crediting period, continuous real-time measurements of the N_2O concentration and the total gas volume flow are carried out in the tail gas stream.
c)	No law or regulation which mandates the complete or partial destruction of N_2O from nitric acid plants exists in the host country where the CDM project activity is implemented.	**Yes**	• There is no Brazilian governmental regulation which restricts N_2O emissions.

[1] http://cdm.unfccc.int/methodologies/DB/MNMFNF10VUEOJACEIRX3EHYC9QXGDC
[2] http://cdm.unfccc.int/Reference/Standards/index.html
[3] http://cdm.unfccc.int/Reference/Standards/index.html
[4] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf
[5] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-08-v2.0.0.pdf/history_view
[6] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf/history_view
[7] For further reading see approved Monitoring and Verification Reports of first crediting period http://cdm.unfccc.int/Projects/DB/DNV-CUK1174479298.53/view

B.3. Project boundary
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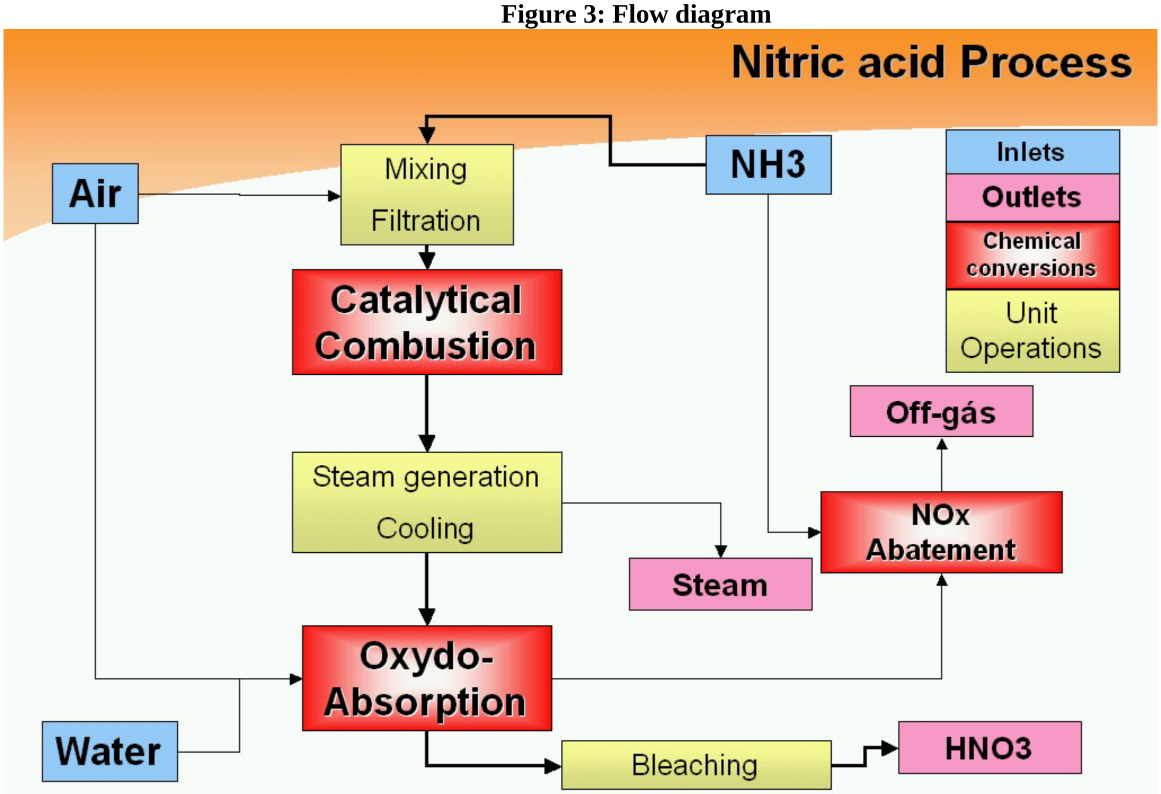
Flow diagram
The spatial extent of the project boundary is the site of the nitric acid production facility. Schematic illustration of the project boundary is provided below.

Figure 3: Flow diagram



A summary of gases and sources included in the project boundary, and justification/ explanation where gases and sources are not included, are provided below.

	Source	GHGs	Included?	Justification / Explanation
Baseline	NH3 oxidation at the primary catalyst gauze	CO_2	No	The project activity has no influence on these types of emissions, if present.
		CH_4	No	
		N_2O	**Yes**	**Included, main emission source**
Project activity	NH3 oxidation at the primary catalyst gauze	CO_2	No	The project activity has no influence on these types of emissions, if present.
		CH_4	No	
		N_2O	**Yes**	**Included, main emission source**
	Operation of a tertiary N_2O Abatement facility	CO_2	No	The project activity is a secondary N2O abatement facility. It doesn't use fossil fuels as reducing agent and/or for decomposing the tail gas
		CH_4	No	

		N_2O	Yes	Included

B.4. Establishment and description of baseline scenario

As per the “Procedure for renewal of the crediting period of a registered CDM project activity”, version 06 (EB63, Annex 29), the renewal of the crediting period shall only be granted if a DOE determines and informs the Executive Board that the original project baseline is still valid or has been updated taking account of new data where applicable.

The demonstration of the validity of the original baseline or its update does not require a reassessment of the baseline scenario, but rather an assessment of the emissions which would have resulted from that scenario.

The Methodological Tool “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period”, version 03.0.1 (EB 66, Annex 47), provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period. This approach is followed below.

Step 1: Assess the validity of the current baseline for the next crediting period

The current baseline is the scenario existing prior to the implementation of the project:

(i) the Nitrous oxide destroyed in the project activity, which in the absence of project activity would be released into the atmosphere; and

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

There are no mandatory national and/or sectoral policies that affect the baseline scenario at the renewal of the crediting period. The fundamental elements of the baseline have not changed since the project was first registered.

Rhodia follows the evolution of Brazilian legislation about N_2O emissions that could affect the project emission reduction as part of the ISO 14001 requirements. Experts on environmental matters from Rhodia Brazil follow closely any project or change in the laws and regulations.[8] They participate in external organizations such as ABIQUIM (Brazilian Association of Chemical Industries) and meetings organized by CETESB (local environmental agency).

It can be concluded that at present there are no quantified governmental effluent controls or obligations to reduce emission of N_2O in Brazil. It is unlikely that any such limits on emissions would be imposed in the near future.

Outcome after step 1.1: It was shown that the current baseline complies with all relevant mandatory national and/or sectoral policies which have come into effect since the project was first registered. The current baseline is still applicable at the time of requesting renewal of the crediting period.

Step 1.2: Assess the impact of circumstances

[8] Internal procedure documents

This step assesses the impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions, without reassessing the baseline scenario. This includes an assessment of:

- changes in market characteristics and validity of the conditions used to determine the baseline emissions in previous crediting period
- availability of new fuels or raw materials and the impact of electricity or fuel prices in the identification of the current practice for the baseline emissions

Changes in market characteristic and validity of the conditions used to determine the baseline in previous crediting period

Since the determination of the baseline in the previous crediting period, the market characteristics didn't change:
The nitric acid production remains stable with a small increase of around 8% worldwide. In the Latin America region, the production of nitric acid increased more (around 16%) due to the start-up of an integrated (ammonia, urea, ammonium nitrate and melamine) plant in Trinidad and Tobago in 2010. This production increase didn't impact the Brazilian market where the productions and consumptions remain identical between 2007 and 2010. The forecasts for 2015 show an increase of the capacities and production in Latin America due to the start-up scheduled in 2014 of an integrated plant in Peru.
The uses of nitric acid didn't change along the years and the production of fertilizers remains the major consumer (around 80% worldwide and Latin America). The adipic acid production remains a small player (less than 3% worldwide and Latin America) [9].
In October 2013, around 50% of the plants which started before 31/12/2005 (applicability constraint of the N2O/nitric acid methodologies (AM0028, AM0034 and AM0051)) have put in place a CDM project. In Latin America, this percentage increases to 80% and even to 100% in Brazil.

In order to confirm the validity of the conditions used for the determination of the baseline in the previous crediting period, the potential alternative use of product and the economic incentive for destruction of N2O were updated.

Potential alternative use of product: It is concluded that neither an alternative usage / selling of N_2O is feasible nor the usage of nitric acid off gas containing N_2O as a feedstock for petrochemical industry. This is because the N_2O content in the stack gas of the plant is very low (between 600 and 1200 ppm only) and because this flow contains impurities in variable concentration that would imply complex purification and concentration units in order to produce potentially marketable N_2O. Very high investment costs would be involved in purification-concentration-liquefaction units to extract N_2O from the exhaust flow of the plant. Furthermore neither the process nor the product would get the necessary certifications for the pharmaceutical, food and semiconductor markets[10]. As these markets represent 97%[11] of N_2O usage there is no N_2O market for N_2O produced as by-product of the nitric acid of the Paulínia plant. However the BASF Group has started in 2010 activities regarding the N_2O (coming from its adipic acid plant where the concentration in N_2O are far higher than in the nitric acid plant of Paulinia) valorization as oxidizing agent[12]. Anyhow the usage of N_2O in cyclododecanone (CDon) and cyclopentanone (CPon) production - analogue to BASF - is not applicable to the Rhodia facilities in Paulínia, because Rhodia produces CPon

[9] SRI Consulting - CEH Marketing Research Report - NITRIC ACID – May 2011
[10] SRI Consulting - CEH Marketing Research Report – Nitrous oxide – May 2011
[11] SRI Consulting - CEH Marketing Research Report – Nitrous oxide – May 2011

[12] http://www.basf.com/group/corporate/en/innovations/research/innovation/innovative-solutions/cdon

only in France, not in Brazil. In addition BASF technology is patented. Rhodia has no right to use it unless a commercial agreement is reached, thus the valorization of N_2O as oxidizing agent in Paulínia is not economically viable for Rhodia.

Economic incentive for destruction of N_2O / negative NPV: The project activity would not be commercially viable. A net present value (NPV) of zero has been chosen to be the relevant financial indicator for the project activity. The NPV is the difference between the sum of the discounted cash flows which are expected from the investment and the amount which is initially invested. This financial indicator is used by most companies including Rhodia group, to assess the economic value of a project. Unless there is a regulatory constraint, projects are required to have a positive NPV with the discount rate defined by the company's management. Otherwise, they are ruled out. Then, projects are ranked and those with the highest NPVs are selected. As there is no alternative investment to the project activity that would generate similar services, the NPV is calculated in the following only for the project activity. If the NPV is lower or equals zero the proposed project activity is additional. The net present value (NPV) of the investment in the decomposition facility considers discount rates of 0%, 5%, 10% and 15%. For the analysis installation costs, annual operational costs from the catalyst have been taken into account. Financing costs have not been taken into account. It has been assumed that the facility operates 30 years. The investment analysis using estimated figures in 2007 has clearly resulted in negative NPV for all chosen scenarios. The investment analysis was repeated in 2013 with real figures and same result.[13] This shows that market characteristics with respect to economic incentive for destruction of N_2O has not changed. Neither the conditions have changed which were used to determine the baseline in previous crediting period.

Investment analysis PDD 2007				Investment analysis 2013			
NPV (EUR)				NPV (EUR)			
0%	5%	10%	15%	0%	5%	10%	15%
-3,388,000	-1,925,245	-1,330,691	-1,044,598	-2,820,033	-1,667,727	-1,199,359	-973,985

Moreover, the methodology ACM0019 V2 considers that "In the absence of regulations requiring the abatement of N_2O emissions, the operator of the nitric acid plant has no economic incentives to take any N_2O abatement measures because this entails capital and operating costs but no financial benefits. Therefore, the CDM project activity is considered additional and the baseline scenario is that the N_2O is emitted to the atmosphere with no N_2O abatement measure being implemented". This confirms that there is no economic incentive for destruction of N_2O from nitric acid plant.

Availability of new fuels or raw materials and the impact of electricity or fuel prices in the identification of the current practice for the baseline emissions

This is not relevant for the project activity.

Outcome after step 1.2: It was shown that there exist no changes in market characteristics. The conditions used to determine the baseline emissions in the previous crediting period are still valid. The current baseline is still applicable at the time of requesting renewal of the crediting period.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

[13] Due to reasons of confidentiality, detailed data used for calculation of the NPV are not made available because those data are vendors or suppliers property. However, all procedure, assumptions, and economical values relevant for the NPV calculation have been revealed to the DOE.

This step should only be applied if the baseline scenario identified at the validation of the project activity was the continuation of use of the current equipment(s) without any investment and, the projects proponents or third party (or parties) would undertake an investment later due, for example, to the end of the technical lifetime of the equipment(s) before the end of the crediting period or the availability of a new technology.

This step is not applicable to the project activity since the baseline is the continuation of the existing practice, meaning no investment is undertaken which could be expected to continue in the absence of the project.

Outcome after step 1.3: The current baseline is still applicable at the time of requesting renewal of the crediting period.

Step 1.4: Assessment of the validity of the data and parameters

According to the "Procedure for renewal of the crediting period of a registered CDM project activity" (V 06.0 / EB 63 Annex 29) the sections of the PDD relating to the baseline, estimated emission reductions and the monitoring plan should be updated using, if applicable, the latest approved version of the baseline and monitoring methodology applied in the original PDD of the registered project.

The methodology AM0034 Version 2 used for the first crediting period was replaced by the Large-scale consolidated methodology ACM0019 Version 2 (see EB73, Annex 7 – 31/05/2013). This consolidated methodology introduces some new parameters or provides new guidance or changes the name for existing parameters; introduces new default values but also some new formulas. The below table summarizes the "gaps" between AM0034 version 2 (registered PDD) and ACM0019 version 2 (for first renewal of crediting period) with respect to baseline, estimated emission reductions and the monitoring plan. It also shows the impact on the PDD.

	Gap analysis	Formerly	Changes in PDD
1.	New summary table of gases and sources included in project boundary and justification / explanation where gases and sources are not included.		Table added
Identification of baseline scenario and demonstration of additionality			
2.	Simplified procedure of "identification of baseline scenario and demonstration of additionality"		Not relevant as explained above. Instead the stepwise approach of the Methodological Tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" is followed.
Change in names or new parameters / change in or new procedures			
3.	$P_{product,max}$		New monitoring parameter
4.	$P_{production,y}$	NAP	Parameter name was updated
5.	$EF_{existing,y}$	EF_{BL}	Parameter name was updated
6.	$EF_{new,y}$		New monitoring parameter
7.	GWP_{N2O}	310	Default value updated (new 298)
8.	h_y	OH	Parameter name was updated
9.	$h_{r,y}$		New monitoring parameter
10.	$EF_{historical}$	EF_{BL}	Parameter name was updated
11.	$EF_{default,y}$		New monitoring parameter
12.	$F_{N2O,tail\ gas,h}$		New monitoring parameter

	Gap analysis	Formerly	Changes in PDD
13.	$P_{NA,h}$		New monitoring parameter

Outcome after step 1.4: Application of steps 1.1, 1.2, 1.3 and 1.4 confirmed that the current baseline is valid for the second crediting period, but some data and parameters needs to be updated.

Step 2: Update the current baseline and the data and parameters
Step 2.1: Update the current baseline
As it was shown above the current baseline remains unchanged. The baseline scenario for the second crediting period remains the existing scenario prior to the implementation of the project:

(i) the Nitrous oxide destroyed in the project activity, which in the absence of project activity would have been released into the atmosphere; and

Step 2.2: Update the data and parameters
The changes required as analyzed in step 1.4 have been taken into account in PDD sections B.6 and B.7.

B.5. Demonstration of additionality
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In the registered PDD of the first crediting period it was proven that there is no economic incentive for the project participant to install the decomposition facility since the NPV value was clearly negative at all discount rates by the time of decision making which makes the project activity additional.

According to the Methodological Tool “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period” (V 03.0.1 / EB 66 Annex 47) a revision of the project’s additionality is not required for the second crediting period.

B.6. Emission reductions
B.6.1. Explanation of methodological choices
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Baseline Emissions

Baseline emissions of year y (measured in t CO_2 eq.) are estimated for:

(i) the Nitrous oxide destroyed in the project activity, which in the absence of project activity would have been released into the atmosphere.

The following equation estimates the baseline emissions:

$$BE_y = \begin{pmatrix} min\{P_{production,y};P_{product,max}\}\times EF_{existing,y} + \\ max\{P_{production,y}-P_{product,max};0\}\times EF_{new,y} \end{pmatrix} \times \frac{(h_y - h_{r,y})}{h_y} \times GWP_{N2O} \times 10^{-3} \quad \textbf{(1)}$$

Where:

BE_y	=	Baseline emissions in year y (t CO_2e)
$P_{product,max}$	=	Design capacity (t HNO_3)
$P_{production,y}$	=	Production of nitric acid in year y (t HNO_3)
$EF_{existing,y}$	=	N_2O emission factor for nitric acid plant in the first crediting period in year y (kg N_2O/t HNO_3)
$EF_{new,y}$	=	Baseline N_2O emission factor for nitric acid production in year y (kg N_2O/t HNO_3)
GWP_{N2O}	=	Global Warming Potential of N_2O valid for the commitment period
h_y	=	Number of hours in year y during which the plant was in operation (h)
$h_{r,y}$	=	Number of hours (*h*) in year *y* where, for secondary N_2O abatement, abatement system was not installed, underperforming or failed

The N_2O emission factor for nitric acid plant in the first crediting period in year y ($EF_{existing,y}$) is calculated as follows:

$$EF_{existing,y} = min\{EF_{historical}; EF_{default,y}\} \quad \textbf{(2)}$$

Where:

$EF_{existing,y}$	=	N_2O emission factor for nitric acid plant in the first crediting period in year y (kg N_2O/t HNO_3)
$EF_{historical,y}$	=	Historical baseline emission factor of the nitric acid plant (kg N_2O/t HNO_3)
$EF_{default,y}$	=	Default emission factor according to the operating pressure of the ammonia burner in year *y* (kg N_2O/t HNO_3)

The abatement system is deemed to be bypassed, not working, underperform or failed in the hour h in year y if:

$$F_{N2O,tail\ gas,h} > EF_{existing\ y} \times P_{NA,h} \quad \textbf{(3)}$$

Where:

$P_{NA,h}$	=	Nitric acid produced in the hour h (t HNO_3)
$EF_{existing,y}$	=	N_2O emission factor for nitric acid plant in the first crediting period in year y (kg N_2O/t HNO_3)
$F_{N2O,tail\ gas,h}$	=	Mass flow of N_2O in the gaseous stream of the tail gas in the hour h (kg N_2O/h)

Project emissions

Project emissions are calculated as follows:

$$PE_y = PE_{N2O,y} + PE_{CO2,tertiary,y} \quad \textbf{(4)}$$

Where:

PE_y	=	Project emissions in year y (t CO_2e)
$PE_{N2O,y}$	=	Project emissions of N_2O from the project plant in year y (t CO_2e)
$PE_{CO2,tertiary,y}$	=	Project emissions of CO_2 from the operation of the tertiary N_2O abatement facility in year y (t CO_2)

As the project activity consists in the installation of a secondary catalyst, the equation can be simplified as:

$$PE_y = PE_{N2O,y}$$

Where:

PE_y	=	Project emissions in year y (t CO_2e)
$PE_{N2O,y}$	=	Project emissions of N_2O from the project plant in year y (t CO_2e)

The amount of N_2O emissions from the project activity are the emissions from the N_2O contained in the tail gas stream of the plant which is released to the atmosphere.
Accordingly, $PE_{N2O,y}$,y is determined as follows:

$$PE_{N2O,y} = \sum_{1}^{h_y - h_{r,y}} F_{N2O,tail\ gas,h} \times GWP_{N20} \times 10^{-3} \quad \textbf{(5)}$$

Where:

$PE_{N2O,y}$	=	Project emissions of N_2O from the project plant in year y (t CO_2e)
GWP_{N2O}	=	Global warming potential of N_2O valid for the commitment period
$F_{N2O,tail\ gas,h}$	=	Mass flow of N_2O in the gaseous stream of the tail gas in the hour *h* (kg N_2O/h)
h_y	=	Number of hours in year *y* during which the plant was in operation (*h*)
$h_{r,y}$	=	Number of hours (*h*) in year *y* where, for secondary N_2O abatement, abatement system was not installed, underperforming or failed

Determination of $F_{N2O,tail\ gas,h}$

1. The amount of N2O emissions from the tail gas stream of the project plant is determined using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream".

2. In applying the tool, the following provisions apply:

   (a) Throughout the crediting periods of the project activity, the N2O concentration (NCSG) and volume or mass flow of the tail gas (VSG) are monitored continuously. The monitoring system is installed and maintained throughout the crediting period based on the European Norm 14181 (2004), or any more recent update of that standard;

   (b) The monitoring system provides separate hourly average values for the N_2O concentration and the volume or mass flow of the tail gas based on two seconds interval readings that are

recorded and stored electronically. These N_2O data sets are identified by means of a unique time/date key indicating when exactly the values were observed;

(c) The correction factors derived from the calibration curve of the QAL2 audit for the monitoring components as determined during the QAL2-test in accordance with EN14181 is applied to both the N_2O concentration and the volume or mass flow of the tail gas. This is applied to the calculated hourly averages as part of the calculation of project emissions;

(d) If data for either the N_2O concentration or the volume or mass flow of the tail gas are not available for more than 1/3 of any hour while the plant was in operation, the value for that hour is replaced with the maximum value of N_2O concentration or volume or mass flow of the tail gas observed during the monitoring period. If data for neither the N_2O concentration nor the volume or mass flow of the tail gas are available for more than 1/3 of any hour while the plant was in operation, the maximum value of mass flow of N_2O calculated during the monitoring period shall be applied to any such hour. Values observed during five operating hours before and after a plant start-up and shut-down are not used for the determination of the maximum values;

(e) In the case that the N_2O concentration and the volume or mass flow of the tail gas are automatically converted to normal conditions by the AMS during the monitoring process, the parameters Pt and Tt do not need to be monitored except, if applicable, for the purpose of determining the moisture content in the gaseous stream.

The "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 2.0.0) is used in the following way:
Due to the characteristics of the AMS, the measurement option chosen for the project is the option B (volume flow on a wet basis and volumetric fraction on a dry basis). The option 2 "simplified calculation without measurement of the moisture content" is also applied and, to be conservative, the absolute humidity of the gaseous stream is assumed to equal 0.

As the N2O fraction is measured directly in mg N2O / Nm3 and not in m3 N2O / Nm3, there is no need to use the density of the greenhouse gas and the formula proposed by the tool can be simplified in:

$F_{N2O,tail\ gas,h} = NCSG_h \text{ x } VSG_h/1000000$

Where:

$F_{N2O,tail\ gas,h}$	=	Mass flow of N_2O in the gaseous stream of the tail gas in the hour *h* (kg N_2O/h)
$NCSG_h$	=	N2O concentration in the stack gas
VSG_h	=	Volume flow rate of the stack gas

Leakage

Any leakage emissions sources are deemed to be negligible

Emission Reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad (7)$$

Where:

ER_y	=	Emission reductions in year y (t CO_2e)
BE_y	=	Baseline emissions in year y (t CO_2e)
PE_y	=	Project emissions in year y (t CO_2e)

B.6.2. Data and parameters not monitored

BASELINE EMISSION

Data / Parameter	**Operating pressure**
Data unit	kPa
Description	Operating pressure of the ammonia burner
Source of data	Manufacturer specifications
Value(s) applied	Between 359 and 385 kPa
Choice of data or Measurement methods and procedures	-
Purpose of data	The parameter is used to determine whether the nitric acid plant operates at a low, medium or high pressure
Additional comment	Data obtained during the baseline campaign previous to the first crediting period

Data / Parameter	$EF_{historical}$
Unit	kg N_2O/t HNO_3
Description	Historical baseline emission factor of the nitric acid plant
Source of data	Historical information from issuance reports of CDM-PDD documents
Value(s) applied	5.7603
Choice of data or Measurement methods and procedures	For plants that used AM0034 in the first crediting period: use the baseline emission factor determined through the latest baseline campaign conducted in accordance with the methodology AM0034
Purpose of data	-
Additional comment	This value will remain constant over the second and third crediting period

<table>
<tr><td>Data / Parameter</td><td>$EF_{default}$</td></tr>
<tr><td>Unit</td><td>kg N_2O/t HNO_3</td></tr>
<tr><td>Description</td><td>Default emission factor according to the operating pressure of the ammonia burner in year y (related to 100 per cent pure acid)</td></tr>
<tr><td>Source of data</td><td>This default N_2O baseline emission factor will vary every year. In the year 2013 the emission factors will be 5.5; 8.4; and 12.6 kg N_2O/t HNO_3 for low, medium and high pressure ammonia burners. For each subsequent year, the emission factors will decrease by 0.2 kg N_2O/t HNO_3 until they reach a value of 2.5 or 2.4. After reaching the values of 2.5 or 2.4 the emission factor will remain constant over time:
<table>
<tr><th>Year</th><th>Low pressure (0 – 200 kPa)</th><th>Medium pressure (200 – 600kPa)</th><th>High pressure (Over 600 kPa)</th></tr>
<tr><td>2013</td><td>5.5</td><td>8.4</td><td>12.6</td></tr>
<tr><td>2014</td><td>5.3</td><td>8.2</td><td>12.4</td></tr>
<tr><td>2015</td><td>5.1</td><td>8.0</td><td>12.2</td></tr>
<tr><td>2016</td><td>4.9</td><td>7.8</td><td>12</td></tr>
<tr><td>2017</td><td>4.7</td><td>7.6</td><td>11.8</td></tr>
<tr><td>2018</td><td>4.5</td><td>7.4</td><td>11.6</td></tr>
<tr><td>2019</td><td>4.3</td><td>7.2</td><td>11.4</td></tr>
<tr><td>2020</td><td>4.1</td><td>7</td><td>11.2</td></tr>
<tr><td>2021</td><td>3.9</td><td>6.8</td><td>11</td></tr>
<tr><td>2022</td><td>3.7</td><td>6.6</td><td>10.8</td></tr>
<tr><td>2023</td><td>3.5</td><td>6.4</td><td>10.6</td></tr>
<tr><td>2024</td><td>3.3</td><td>6.2</td><td>10.4</td></tr>
<tr><td>2025</td><td>3.1</td><td>6</td><td>10.2</td></tr>
<tr><td>2026</td><td>2.9</td><td>5.8</td><td>10</td></tr>
<tr><td>2027</td><td>2.7</td><td>5.6</td><td>9.8</td></tr>
<tr><td>2028</td><td>2.5</td><td>5.4</td><td>9.6</td></tr>
<tr><td>2029</td><td>2.5</td><td>5.2</td><td>9.4</td></tr>
<tr><td>2030</td><td>2.5</td><td>5.0</td><td>9.2</td></tr>
</table></td></tr>
<tr><td>Value(s) applied</td><td>Medium pressure values</td></tr>
<tr><td>Choice of data or Measurement methods and procedures</td><td>None</td></tr>
<tr><td>Purpose of data</td><td>-</td></tr>
<tr><td>Additional comment</td><td>The decrease in the value for the baseline emission factor over time is to reflect the technological development</td></tr>
</table>

Data / Parameter	EF_{new}
Unit	kg N_2O/t HNO_3
Description	Baseline N_2O emission factor for nitric acid production in year *y* (related to 100 per cent pure acid)
Source of data	The baseline N_2O emission factor for nitric acid production will vary every year. In year 2005 the emission factor was 5.1 and then it will decrease every year until it reaches a final value of 2.5 in the year 2020. The value of 2.5 will remain constant after 2020, as provided in the following table: (see table below)
Value(s) applied	From 2014 onwards depending of the monitoring period
Choice of data or Measurement methods and procedures	
Purpose of data	-
Additional comment	The decrease in the value for the baseline emission factor over time is to reflect the technological development

Year	**Emission factor (kgN_2O/t HNO_3)**
2005	5.10
2006	4.90
2007	4.70
2008	4.60
2009	4.40
2010	4.20
2011	4.10
2012	3.90
2013	3.70
2014	3.50
2015	3.40
2016	3.20
2017	3.00
2018	2.80
2019	2.70
2020	2.50
2021	2.50
2022	2.50
2023	2.50
…	…
Year n	2.50

Data / Parameter	**$P_{product,max}$**
Unit	t HNO_3
Description	Design capacity of nitric acid production during the first crediting period
Source of data	Project operator and/or technology provider
Value(s) applied	55,900
Choice of data or Measurement methods and procedures	-
Purpose of data	-
Additional comment	This parameter is only for project activities that have used AM0034 or AM0028 in the first crediting period

BASELINE AND PROJECT EMISSION

Data / Parameter	**GWP_{N2O}**
Unit	tCO_2e/tN_2O
Description	Global warming potential of the N_2O during the crediting period
Source of data	IPCC http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14 "Standard for application of the global warming potentials to CDM project activities and PoAs for the second commitment period of the Kyoto Protocol (version 01.0)"
Value(s) applied	298
Choice of data or Measurement methods and procedures	-
Purpose of data	BASELINE EMISSION and PROJECT EMISSION
Additional comment	-

B.6.3. Ex ante calculation of emission reductions
>>
The nitric acid unit data used for ex-ante calculations of emission reductions are data from 26/11/2011 until 25/11/2012. The emission factors ($EF_{default,y}$, $EF_{new,y}$) used correspond to the new crediting period dates

(1) Baseline emissions:

The N_2O emission factor for nitric acid plant in the first crediting period in year y ($EF_{existing,y}$) is :

$$EF_{existing,y} = min\{EF_{historical}; EF_{default,y}\}$$

$EF_{default,y}$	=	8.0	kg N_2O/t HNO_3
$EF_{historical,y}$	=	5.7603	kg N_2O/t HNO_3
$EF_{existing,y}$	=	5.7603	kg N_2O/t HNO_3

The baseline emissions are:

$$BE_y = \begin{pmatrix} min\{P_{production,y};P_{product,max}\}\times EF_{existing,y}+ \\ max\{P_{production,y}-P_{product,max};0\}\times EF_{new,y} \end{pmatrix} \times \frac{(h_y-h_{r,y})}{h_y} \times GWP_{N2O} \times 10^{-3}$$

$P_{product,max}$	=	55,900	t HNO_3
$P_{production,y}$	=	45,982	t HNO_3
$EF_{existing,y}$	=	5.7603	kg N_2O/t HNO_3
$EF_{new,y}$	=	3.4	kg N_2O/t HNO_3
GWP_{N2O}	=	298	tCO_2e/tN_2O
h_y	=	6860.8	h
$h_{r,y}$	=	0	h
BE_y	=	78,931	t CO_2e

(2) Project emissions:

$$PE_y = PE_{N2O,y}$$

$$PE_{N2O,y} = \sum_{1}^{h_y-h_{r,y}} F_{N2O,tail\ gas,h} \times GWP_{N20} \times 10^{-3}$$

$\Sigma F_{N2O,tailgas,h}$	=	25,392.4	kg N_2O
GWP_{N2O}	=	298	tCO_2e/tN_2O
PE_y	=	7,567	t CO_2e

(3) Emission reductions:

$$ER_y = BE_y - PE_y$$

BE_y = 78,931 t CO_2e
PE_y = 7,567 t CO_2e

ER_y = 71,364 t CO_2e

B.6.4. Summary of ex ante estimates of emission reductions
>>

Year	Baseline emissions (t CO2e)	Project emissions (t CO2e)	Leakage emissions (t CO2e)	Emission reductions (t CO2e)
28/07/2014 - 31/12/2014	33,951	3,255	0	30,696
01/01/2015 - 31/12/2015	78,931	7,567	0	71,364
01/01/2016 - 31/12/2016	78,931	7,567	0	71,364
01/01/2017 - 31/12/2017	78,931	7,567	0	71,364
01/01/2018 - 31/12/2018	78,931	7,567	0	71,364
01/01/2019 - 31/12/2019	78,931	7,567	0	71,364
01/01/2020 - 31/12/2020	78,931	7,567	0	71,364
01/01/2021 - 27/07/2021	44,980	4,312	0	40,668
Total	**552,517**	**52,969**	**0**	**499,548**
Total number of crediting years	**7**			
Annual average over crediting period	**78,931**	**7,567**	**0**	**71,364**

B.7. Monitoring plan
B.7.1. Data and parameters to be monitored

BASELINE EMISSION

Data / Parameter	$P_{production,y}$
Unit	t HNO_3
Description	Nitric acid produced in year *y*
Source of data	Measurements by project participants and production reports
Value(s) applied	Historical data from first crediting period : 45,982.1
Measurement methods and procedures	The quantity of nitric acid is determined on a daily basis using the data provided by the flow meter measurement and the nitric acid concentration obtained through density measurement.
Monitoring frequency	Continuous
QA/QC procedures	Metering instruments shall be calibrated regularly following internal procedure included in the ISO9001 system of the plant and according to industry standards or manufacturer's specifications Flow meter: Accuracy: +/- 1% Calibration frequency: yearly Specific mass densimeter: Accuracy: +/- 0.05% Calibration frequency: replaced at the end of calibration validity Thermometer: Accuracy: +/- 0.5% Calibration frequency: replaced at the end of calibration validity
Purpose of data	Baseline emissions
Additional comment	Records to be archived at least for two years after the end of the last crediting period

PROJECT AND BASELINE EMISSION

Data / Parameter	h_y
Unit	H
Description	Number of hours of operation in a year y
Source of data	Measured/Calculated
Value(s) applied	Historical data from first crediting period: 6,860.8
Measurement methods and procedures	The number of hours of operation is daily calculated subtracting the hours when the ammonia feed on the reactor is below of 0.8 t/h. This calculation is done by PIMS considering the value of ammonia feed provided by flowmeter.
Monitoring frequency	Monthly
QA/QC procedures	Metering instruments shall be calibrated regularly following internal procedure included in the ISO9001 system of the plant and according to industry standards or manufacturer's specifications Flowmeter: Accuracy: +/- 2% Calibration frequency: yearly
Purpose of data	Baseline and project emissions
Additional comment	Records to be archived at least for two years after the end of the last crediting period

Data / Parameter	$h_{r,y}$
Unit	h
Description	Number of hours in year *y* where, for secondary N_2O abatement, abatement system was not installed, underperforming or failed
Source of data	Measured/Calculated
Value(s) applied	Historical data from first crediting period: 0
Measurement methods and procedures	The number of hours where, for secondary N_2O abatement, abatement system was not installed, underperforming or failed is determined by comparison of $F_{N2O,tail\ gas,h}$ and $EF_{existing,y}$ x $P_{NA,h}$ This comparison is done on an hourly basis.
Monitoring frequency	Monthly
QA/QC procedures	Metering instruments shall be calibrated regularly following internal procedure included in the ISO9001 system of the plant and according to industry standards or manufacturer's specifications
Purpose of data	Baseline and project emissions
Additional comment	Records to be archived at least for two years after the end of the last crediting period

Data / Parameter	**NCSG**
Unit	mg/Nm^3
Description	N_2O concentration in the stack gas
Source of data	Measured
Value(s) applied	Historical data from first crediting period
Measurement methods and procedures	N_2O concentration infrared analyzer Principle is a non-dispersive infrared absorption in the λ = 2.5–8 µm wavelength range Network server for the automatic acquisition and Excel Workbook for the hourly data
Monitoring frequency	Continuous
QA/QC procedures	Metering instruments shall be calibrated regularly following internal procedure included in the ISO9001 system of the plant and according to industry standards or manufacturer's specifications Analyzer: Accuracy Class : +/- 0.5 % Calibration frequency: 2/year
Purpose of data	Baseline and project emissions
Additional comment	NCSG is used for hourly calculation of $F_{N2O,tailgas,h}$ Records to be archived at least for two years after the end of the last crediting period

Data / Parameter	**VSG**
Unit	Nm^3/h
Description	Volume flow rate of the stack gas
Source of data	Measured
Value(s) applied	Historical data from first crediting period
Measurement methods and procedures	Venturi flow meter built according standard ISO 5167 - 2003 Edition. The same multi-variable transmitter provides also the temperature and pressure at the stack where the gas flow is measured. Network server for the automatic acquisition and Excel Workbook for the hourly data
Monitoring frequency	Continuous
QA/QC procedures	Metering instruments shall be calibrated regularly following internal procedure included in the ISO9001 system of the plant and according to industry standards or manufacturer's specifications Flowmeter: Accuracy Class : +/- 2.0 % Calibration frequency: yearly
Purpose of data	Baseline and project emissions
Additional comment	VSG is used for hourly calculation of $F_{N2O,tailgas,h}$ Records to be archived at least for two years after the end of the last crediting

	period

B.7.2. Sampling plan

>>

Not applicable: methodology ACM0019 version 2 does not specify any requirement on sampling.

B.7.3. Other elements of monitoring plan

>>

All data collection procedures, organizational structure, roles and responsibilities and procedures for dealing with abnormal situations are described in detail in the Data Handling Protocol which is a document of Rhodia Quality System. Rhodia Paulínia plant is ISO9001 and ISO14001 certified.

Operational and management structure: The Production Manager, or function defined by delegation, is responsible for implementing and maintaining the monitoring procedures on site (Data Handling Protocol, training, calibration and maintenance) and for validating all data. The overall responsibility of the project belongs to the CO2 Operations Director located in Paris, France.

It is the responsibility of the CO2 Operation Coordinator, or function defined by delegation, to develop and implement a management and operational system that meets all monitoring requirements.

Internal trainings: It is the Plant Manager’s responsibility to ensure that the required capacity and internal trainings are made available to assigned staff to enable them to undertake the tasks required by the CDM monitoring plan. All staff involved in any of the procedures will be trained in order to perform the monitoring tasks. For this purpose a training protocol is prepared.

Data handling protocol: The establishment of a transparent system for the collection, computation and storage of data, including adequate record keeping and data monitoring systems is required. It is the Production Manager or function defined by delegation responsible to ensure the implementation of those documents. For electronic-based and paper-based data entry and recording systems, there must be clarity in terms of the procedures and protocols for collection and entry of data, usage of the spreadsheets and any assumptions made, so that compliance with requirements can be assessed by the DOE. Stand-by processes and systems, e.g. paper-based systems, must be outlined and used in the event of, and to provide for, the possibility of systems failures.

Data collection and measurement: The Production Engineer, or function defined by delegation is in charge of all data collection activities. All the data used for monitoring the baseline, project and leakage emissions are collected either in the PIMS (Plant Information Management System) or the Daily Production Reports:

- Process data (flow rates, pressures, temperatures etc.) are continuously acquired by the DCS (Distributed Control System) and automatically stored by PIMS;

The calculation of the daily production of nitric acid is carried out using the data stored in PIMS and daily packing report, and the daily nitric acid consumption quantity is calculated by using the data stored in PIMS. The results obtained are collected in a Daily Production Report (excel sheet) and transferred to the Workbook. In parallel the packed quantities are entered in SAP system (System, Applications and Products for Data Processing) which is the official system used by Rhodia for production management, supply chain management and accounting purposes.

Data processing, validation, adjustment, and recording: The Plant Operations Technician by delegation from Production Manager, processes the data, checks the data for consistency, validates them, and records them in an electronic file. In case of failure of an instrument, or non-consistency of the data, the responsible person adjusts the data according to the procedure (Data Handling Protocol). In case of any deviation scenario that is not covered, the most conservative calculation will be applied following the resolution presented in the EB65/Annex 5.

Workbook for emission reduction calculation: The calculation of the emission reductions will be undertaken with an Excel spreadsheet („workbook“) for each verification and serves as a database for the periodic reporting to the verifying DOE. After completion of the workbook the emission reductions results are reviewed according to the procedures laid out in the data handling protocol. Data collection activities have been designed to derive verifiable monthly and yearly values from the periodic measurements undertaken for each parameter that can be easily processed in the workbook. The workbook is saved on the plant server under a unique name reflecting the period for which monitoring has been carried out. In addition, after each data entry and/or modification of the workbook, electronic copies of the workbook shall be saved under a new name. Process data are periodically extracted from PIMS using an excel file called BD-Workbook and transferred to the Workbook. The laboratory and some external data such as natural gas composition are manually entered into the Workbook (e.g.: natural gas composition). The calculations made in the Workbook are used for the preparation of the monitoring report.

Data archiving: The Production Manager or function defined by delegation is responsible for archiving the data. Once validated, the data are input in an electronic folder and protected against any modification. A backup of all the data is automatically made every day on the plant server. Both original document and the backup file are kept for at least for two years after the end of the last crediting period.

Calibration and maintenance protocol: It is the Plant Manager or function defined by delegation who is responsible to ensure that the per manufacturers specifications required calibration and maintenance procedures for all measurement instruments relevant for monitoring the parameters included in the CDM monitoring plan. A calibration and maintenance protocol is established for this purpose. All measuring instruments used in this project are calibrated and maintained according to the specifications provided by the manufacturers and/or the relevant national and international standards.

SECTION C. Duration and crediting period

C.1. Duration of project activity
C.1.1. Start date of project activity
>>
01/05/2007

C.1.2. Expected operational lifetime of project activity
>>
30 years

C.2. Crediting period of project activity
C.2.1. Type of crediting period
>>
Second renewable crediting period

C.2.2. Start date of crediting period
>>
28/07/2014

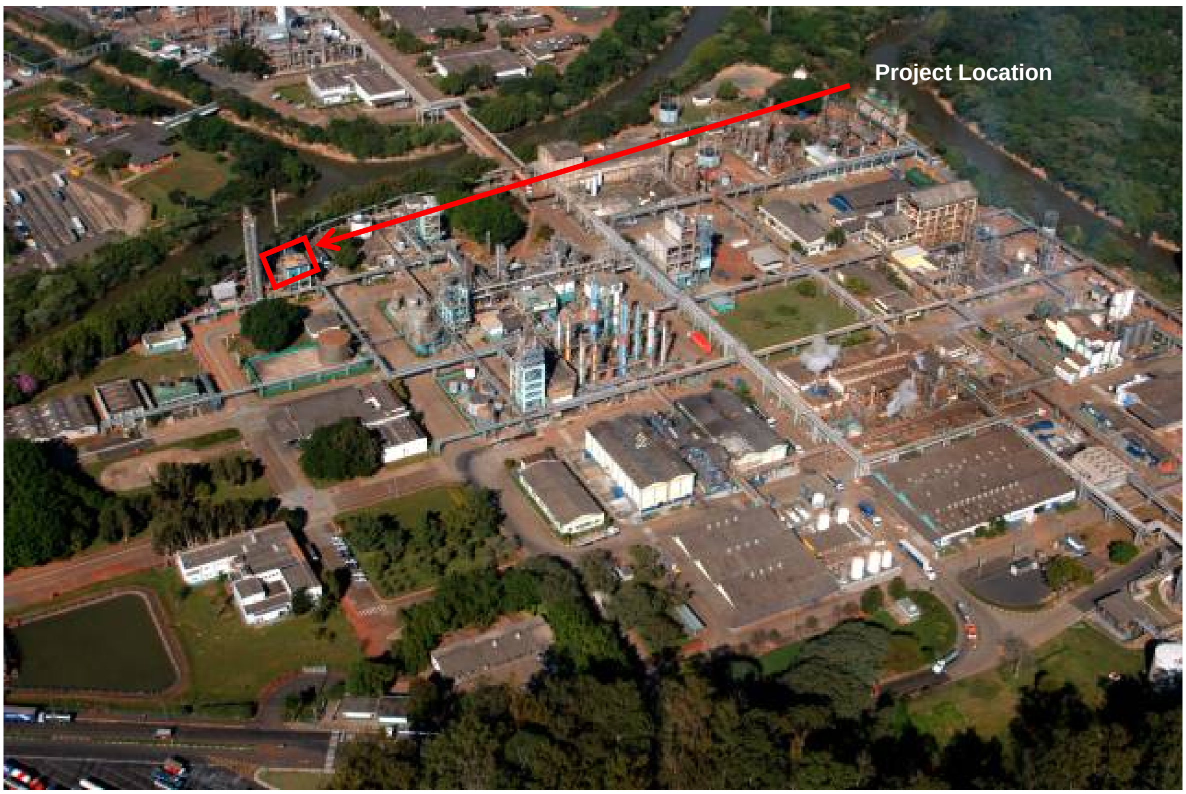
C.2.3. Length of crediting period
>>
7 years

SECTION D. Environmental impacts
D.1. Analysis of environmental impacts
>>

Rhodia Paulínia is in operation since 1956 and plant is located in the petrochemical district of Paulínia of which total area is 1,777,269 m^2.

The project activity is only the introduction of a catalyst layer inside an existent equipment and will not occupy any additional area in the site.

Fig.1- Aerial view of Rhodia's Plant in Paulínia



Paulínia is a city of 58,827 (2004, IBGE) inhabitants situated inside Campinas metropolitan region and it is located in the northeast region of the State of São Paulo, 118 km from the city of São Paulo. The region around Paulínia is largely industrial and comprises many chemical, fertilizer, textile, pharmaceutical, electronic and automobile companies, and also the biggest oil refinery in Brazil.

Through the Resolution n° 03 of 06/28/90, The National Council for the Environment (CONAMA, in Portuguese) establishes the air quality standards for different pollutants, such as total particulate matter, particulate matter (PM- 10), smoke, SO_2, NO_2, CO, O_3.

According to the Brazilian legislation, the States have the competence to develop environmental regulations in addition to CONAMA requirements. The Environmental Agency of the State of São Paulo

(CETESB) which is the responsible for environmental enforcement,, monitoring and licensing, does not go beyond CONAMA requirements, except for Ozone episodes criteria, for which state regulation is more restrictive.

Moreover, the State Public Attorney for Diffuse Matters (*Ministério Público* - MP) is empowered to represent the community interests as a whole, including environmental matters. The MP has the right to make additional environmental enforcement in alignment with the society's general interests.

Despite of the high degree of industrialization in the region of Paulínia, the concentrations of most of the air pollutants are still below the standards established by CONAMA (CETESB, 2005). The only parameter above CETESB standards is the ground-level Ozone. Actually, Paulínia is the city outside São Paulo Metropolitan Region (SPMR) with the greatest number of days above the Ozone standards, as shown in Figure 2.

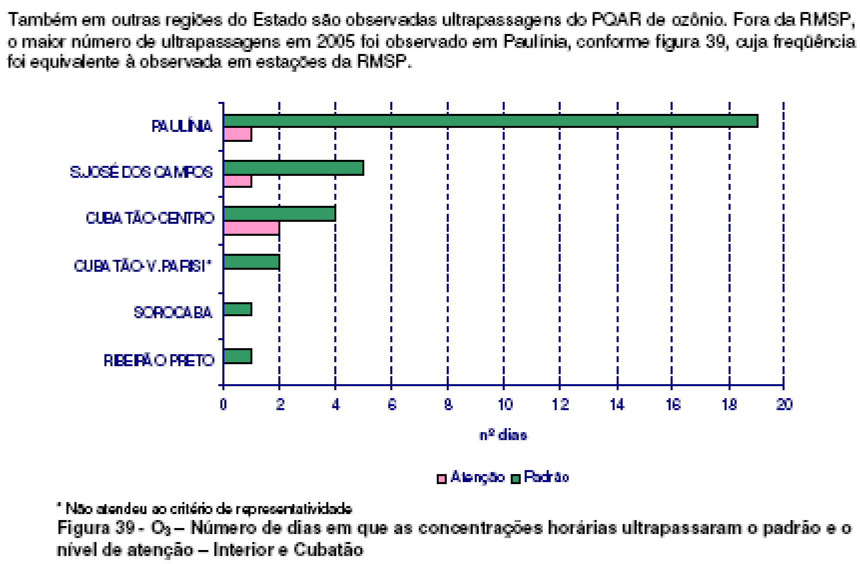


fig 2 – Number of days in which the concentration of ground-level Ozone

was above the CONAMA standard (CETESB, 2005)

The Ground-level Ozone is not emitted directly into the air, but it is created by chemical reactions between Nitrogen Oxides (NOx) and Volatile Organic Compounds (VOC) in the presence of sunlight. As a consequence, this pollutant may cause breathing problems, eye irritations, stuffy nose, reduced resistance to colds and other infections.

Rhodia Paulínia's plant is already in compliance with current Brazilian regulation for gaseous emissions according to the Environmental Permit (Licença de Operação - LO) number 37001414 of 02/04/2012, valid

until April, 2014, when it will be renewed. Additionally, Rhodia Paulínia has signed and fulfilled a Commitment Agreement (TAC- in Portuguese) with the Public Attorney for São Paulo State Diffuse Matters (Ministério Público) in which the company commits to “implement, keep, and operate with state of the art equipment for pollutant emission control in its nitric acid plant”. The TAC also stipulates a residual NO_X (expressed in NO_2) emission below or equal to 200 ppm (parts per million), which is the specific standard for Rhodia’s plant, under the agreement with the Ministério Público.

The introduction of the N_2O abatement catalyst has mostly positive environmental impacts due to the following reasons:

- The secondary catalyst promotes only the N_2O molecules decomposition reaction, thus generating N_2 and O_2.
- This decomposition leads to an emission reduction of this GHG, with no liquid or solid waste generation.
- There is no solid waste due to the use of the catalyst. After its life cycle is completed it will be returned to the manufacturer for being recuperated and sent back to Rhodia’s process.

The assessment of the project impact on air quality is summarized in the following table.

Impacts	Amount	Observations
Positive impacts		
Reduction of GHG emission	≈ 76,946 tCO_2e/yr	- Contribution to the global Climate Change mitigation due to N_2O abatement.
No change		
CO_2 emission	-	- There is no CO_2 creation in the NO_2 decomposition reaction.
Negative Impact		- There is no negative impact

D.2. Environmental impact assessment
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Rhodia has already reported the implementation of the project activity to the Environmental Agency of the State of São Paulo (CETESB), which, after analysis of the process, issued a technical report 37100023 on 08/08/2006 where the conclusion is that this project doesn't need any environmental permission.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

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Rhodia has decided to visit local stakeholders in order to present and to explain the N_2O Abatement project of Nitric Acid Paulínia plant. During the visits, Rhodia technicians and the stakeholders were able to discuss the advantages, perceptions and the environmental and social benefits of the implementation of the new project.

This way, first step of the invitation process was to develop a list of stakeholders. The starting point for this task was the Resolution #1, issued by the Brazilian Designated National Authority – ***Comissão Interministerial de Mudança Global do Clima (CIMGC)***, which establishes a minimum list of stakeholders to be invited. The following stakeholders were included on the mentioned list:

- Paulínia City Hall;
- Paulínia Chamber of Council;
- Environmental Agency of the State of São Paulo (CETESB);
- Environmental Agency of the Municipality of Paulínea (SEDDEMA);
- Brazilian Forum of NGOs (FBOMS);
- Community Associations:
    - Bressami Community Association
    - Jardim Calegari Community Association
    - Morumbi e Santa Terezinha Community Association
- Public Attorney for São Paulo State Diffuse Matters (Ministério Público);
- Campinas University – UNICAMP.

Due to the diversity of the stakeholders and different levels of knowledge of each stakeholder, Rhodia's strategy was to develop a basic model of the invitation and a brief presentation about Climate Change, Clean Development Mechanism and the N_2O Abatement project of Paulínia.

Consequently, with this material, Rhodia technicians visited stakeholders and were able to adjust the approach and language for each stakeholder based on their knowledge. This strategy aims to guarantee that all of the stakeholders have enough information to provide comments.

Some of the mentioned stakeholders were contacted through official channels either using registered mail or certified, due to some official regulations and internal procedures of some agencies and institutions. In these cases, the information related to the project was sent attached to the invitation model.

The visits were organized by Rhodia and included a brief presentation of the project.

Finally, Rhodia published an announcement in the "Jornal de Paulínia", a local newspaper, on 19/08/2006 :

Comunicado ao público

A Rhodia Poliamida Especialidades Ltda toma público que está estudando seu 2º projeto para redução das emissões de gás de efeito estufa na sua Unidade localizada no município de Paulínia, o qual já está sendo submetido a análise junto aos órgãos de controle ambiental.

E.2. Summary of comments received

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The following table summarizes all the stakeholders consultation processes including comments received .

Stakeholder	Sector/category	Strategy	Contact info	Obsevations	Position	Summary of contents
Paulinia City Hall	Governmental/ City	Meeting with Mayor. Project presentation, signature collection, invitation letter for comments delivery	Name: EDSON MOURA (Mayor) Phone: (19) 3874-5500 Date of the contact: August 11, 2006	Meeting with the Mayor, Edson Moura	FAVORABLE TO THE PROJECT	"The project has my approval". "The project is a second important step and will contribute with other companies for adopting similar behaviours"
Paulinia Chamber of Council	Governmental/ City	Meeting with the President of the Chamber. Project presentation, signature collection, invitation letter for comments delivery	Name: SIMONE MOURA (Mayor) Phone: (19) 3874-7800 Date of the contact: August 1, 2006	Meeting with the President of the Chamber Council, Simone Moura	FAVORABLE TO THE PROJECT	"I would like to congratulate Rhodia for this valuable initiative". "Definitively, the project will bring benefits beyond the region where the project is located"
Environmental Agency of the State of são Paulo (CETESB)	Governmental/ State	Delivering of the invitation letter for comments in annex to the request for environmental license information (first step of license process)	Name: MARIO FONSECA / THYAGO ALVES Phone: (19) 3874-1699 Date of the contact: August 1, 2006	Meeting with Mario Fonseca (Local Manager) and Thyago Alves (Local Agent). Mario will discuss with CETESB's Board. The environmental permit process has already begun with CETESB	FAVORABLE TO THE PROJECT	"The project contributes to sustainable development once it will reduce the emission of greenhouse gas"
Environmental Agency of the Municipality of Paulinia (SEDDEMA)	Governmental/ City	Meeting with an official representative of the agency. Project presentation, signature collection, invitation letter for comments delivery	Name: VICENTE MORAES DE SOUZA Phone: (19) 3874-4455 Date of the contact: August 1, 2006	Meeting with the Municipal Secretary for Environment Vicente Moraes de Souza who received the questionnaire	NOT RECEIVED	COMMENTS NOT RECEIVED
Brazilian Forum of NGO's - FBOMS	NGOs	Sending an invitation letter for comments and PDD draft by registered mail	Name: ESTHER NEUHAUS Address: SCS, Quadra 08, Bloco B-50 Venâncio 2000, Salas 133/135, CP-70333-900 Brasilia-DF, BRASIL Phone: (61) 3033-5535 or 3033-5545 Date of the contact: August 25, 2006	The questionnaire was sent to the FBOMS on October 12, 2006	FAVORABLE TO THE PROJECT	"This project must contribute for the sustainable development using sustainable criterias for avaliation"
JARDIM CALIGARI Community Association	Local Community	Meeting with Community Association representative. Project presentation, signature collection, invitation letter for comments delivery	Name: LAERCIO NALE Date of the contact: August 1, 2006	Meeting with the President of the Community Association of Jardim Caligari, Laércio Nale	FAVORABLE TO THE PROJECT	"I would like to congratulate the company for this initiative"
BRESSAMI Community Association	Local Community	Meeting with Community Association representative. Project presentation, signature collection, invitation letter for comments delivery	Name: MARIA BORGHI Phone: (19) 3844-4150 Date of the contact: August 1, 2006	Meeting with the President of the Community Association of Bressiami de Paulinia, Maria Borghi	FAVORABLE TO THE PROJECT	"The implementation of the project will bring social and environmental benefits to the region"
MORUMBI AND SANTA TEREZINHA Community Association	Local Community	Meeting with Community Association representative. Project presentation, signature collection, invitation letter for comments delivery	Name: VALDIR DA SILVA Phone: (19) 3844-5996 Date of the contact: August 1, 2006	Meeting with the President of the Community Association of Santa terezinha, Valdir da Silva	FAVORABLE TO THE PROJECT	"I believe this is a very good project"
Public Attorney for Diffuse Matters of the State of São Paulo (Ministério Publico)	Governmental/ State	Sending of the invitation letter for comments by registered mail	Name: JORGE MAMEDE MASSERAN Phone: (19) 3874-3406 Date of the contact: August 11, 2006	The questionnaire was left for comments at the Public Attorney for Diffuse Matters of the State of São Paulo (Ministério Publico) office in Paulinia	NOT RECEIVED	COMMENTS NOT RECEIVED
Unicamp - University of Campinas	Academic Society	Meeting with academic representative. Project presentation, signature collection, invitation letter for comments delivery	Name: EDSON THOMAZ Phone: (19) 3788-2953 Date of the contact: August 1, 2006	Meeting with Professor Edson Thomaz from the Environmental Engineer Department	FAVORABLE TO THE PROJECT	"The project creates an opportunity and an incentive for national technology development"

E.3. Report on consideration of comments received

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As no negative or technical comments have been received, no modifications on the project were done.

SECTION F. Approval and authorization
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Party	Project participant	Date of issuance
Republic of Brazil has ratified the Kyoto Protocol on 23/08/2002.	Rhodia Energy Brazil Ltda	08/02/2007
France has ratified the Kyoto Protocol on 31/05/2002.	Rhodia Energy	19/03/2007
	Rhodia Energy GHG	19/03/2007
	ORBEO	19/03/2007
Switzerland	Rhodia Energy GHG SAS	27/06/2008

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Appendix 1: Contact information of project participants

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Appendix 2: Affirmation regarding public funding

No public funding is used.

Appendix 3: Applicability of selected methodology

No further information

Appendix 4: Further background information on ex ante calculation of emission reductions

No further information

Appendix 5: Further background information on monitoring plan

No further information

Appendix 6: Summary of post registration changes

Not applicable

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History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	EB 66 13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).
03	EB 25, Annex 15 26 July 2006	
02	EB 14, Annex 06b 14 June 2004	
01	EB 05, Paragraph 12 03 August 2002	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		