Approved baseline methodology AMXXXX

"Baseline Methodology for decomposition of N_2O from existing adipic acid production plants"

Source

This methodology is based on the N_2O Emission Reduction Project in Onsan, South Korea, whose baseline study, monitoring and verification plan and project design document were prepared by MM Pascal Chalvon Demersay / Rhodia Energy and Patrick Rossiny / Rhodia Group / Rhoditech and with the expertise of Mr Axel Michaelowa from Perspective Climate Change / Hamburg / Germany on behalf of Rhodia Polyamide Co. Ltd. For more information regarding the proposal and its consideration by the Executive Board please refer to case NM0061: "N_2O Emission Reduction Project in Onsan" on http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

Selected approach from paragraph 48 of the CDM modalities and procedures

"Existing actual or historical emissions as applicable"

Applicability

This methodology is applicable to projects which decomposes N_2O from adipic acid production plants under the following conditions:

- Either catalytic or thermal decomposition of the N_2O by-product of adipic acid production at existing production plants.
- The methodology is spatially generic, being applicable across regions where the data (both related to baseline and project activity as well) exist to undertake the assessments.
- The methodology is applicable only for the existing (by the start of project activity) production capacity (measured in tonnes of adipic acid per year) at this plant, which is defined as the maximum (annual) production of adipic acid during any one of the previous three (3) years operating history between beginning of the year 2000 and the end of the year 2004.

This baseline methodology shall be used in conjunction with the approved monitoring methodology AMXXXX ("Monitoring Methodology for decomposition of N2O from existing adipic acid production plants").

Project activity

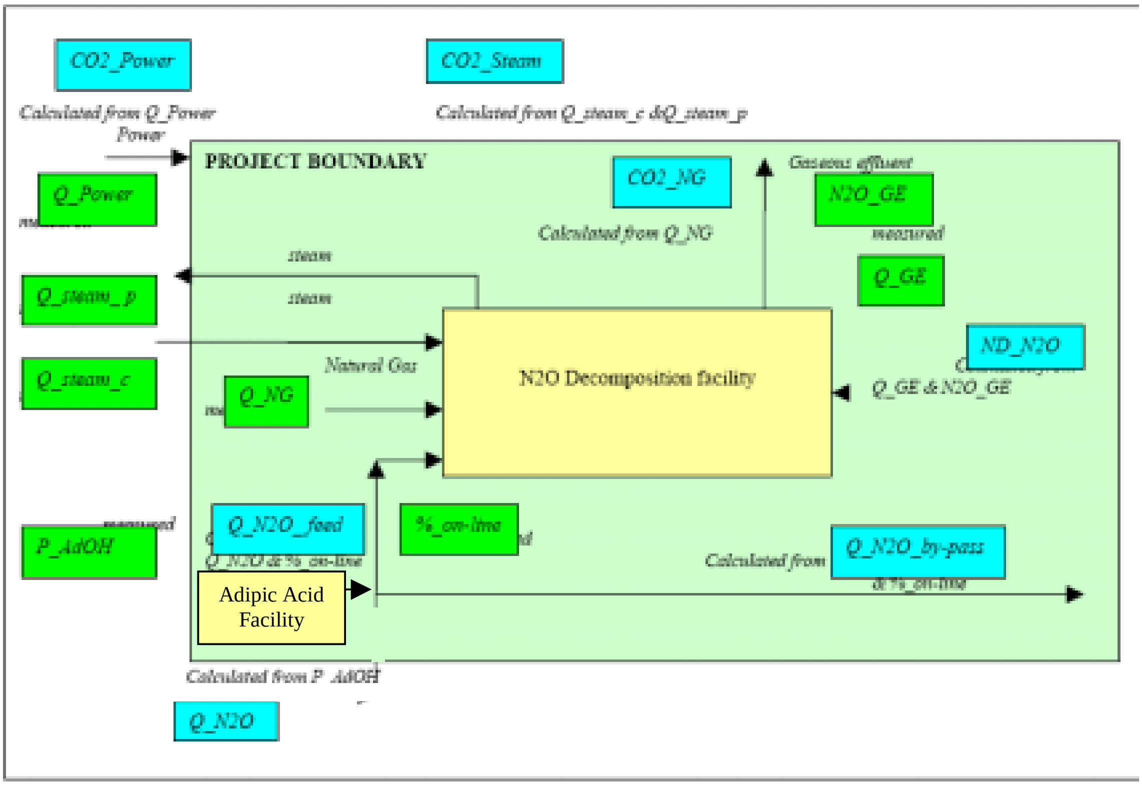

Figure 1: **Schematic illustration of the project activity**

Production of adipic acid generates N_2O as a by-product. Nitrous oxide (N_2O), is typically released into the atmosphere as it does not have any economic value. This baseline methodology is for a project that consists of the installation of a dedicated decomposition facility to convert the nitrous oxide into nitrogen, and thereby prevent its release to the atmosphere.

Baseline

The baseline scenario is defined as the continuation of N_2O emissions to the atmosphere at the rate currently observed, absent regulations to restrict N_2O. The baseline emissions are calculated on an *ex-post* basis from the amount of adipic acid production. To exclude the possibility of manipulating the production process to increase the emissions rate, the current emissions rate is capped by a conservative value for N_2O emissions from an adipic acid plant. If no historical data are available, the lowest emission factor of N_2O per tonne of adipic acid produced specified by IPCC Good Practice Guidance shall be used (i.e. 0.27 t N_2O per tonne of adipic acid produced).

If the local regulation is modified during the crediting period, the possible impact on the calculation of baseline emissions shall be considered without delay by adjusting the baseline N_2O decomposition rate.

Due to the project activity saturated steam is produced, which will be fed into the existing steam network.

Baseline emissions of year y (measured in t CO_2 eq.) are given by

BEy = Q_N2Oy × GWP_N_2O + Q_Steam_py × E_Steamy **(1)**

where:

Q_N2Oy is the quantity of N_2O emitted during the year y
GWP_N_2O is the global warming potential of N_2O
Q_Steam_py is steam generated by the decomposition process during the year y
E_Steamy is the CO_2 emission factor of steam generation

GWP_N_2O is set at 310 according to Kyoto Protocol rules.

The quantity of N_2O emitted is Q_N2Oy, and is calculated as the actual emissions rate during the year y times the total amount of adipic acid produced

Q_N2Oy = (P_AdOH × N_2O_/ AdOH)y **(2)**

where:

P_AdOH is the total amount of adipic acid produced
N_2O_/ AdOH (t N_2O/t adipic acid) is the actual emissions rate caped by the lowest emission factor of 0.27 t N_2O per tonne of adipic acid produced specified by the IPCC Good Practice Guidance.

If a new regulation concerning N_2O emissions is introduced or an existing regulation is changed during the crediting period, the possible impact on the calculation of baseline emissions shall be considered without delay by adjusting the baseline N_2O decomposition rate. This adjustment is done as follows depending on the character of the regulation:

- A regulation regarding the absolute quantity of N_2O emitted implies
  Q_N2Oreg (t N_2O) substitutes (P_ AdOH × N_2O_/ AdOH)y

- A regulation regarding an N_2O emissions rate implies
  N2Oreg/AdOH (t N_2O/t adipic acid) substitutes N_2O_/ AdOH

- A regulation regarding the share (ry) of the N_2O in the waste stream required to be destroyed implies
  N_2O_/ AdOH * (1- ry) substitutes N_2O_/ AdOH

Calculating of N_2O emission rate N_2O_/ AdOHy in adipic acid production:

The N_2O production by the adipic acid plant can be related to the “chemical consumption” and “physical loses” of nitric acid, HNO3, in the process.

HNO3_consumption = HNO3_chemical + HNO3_physical **(3)**

Physical losses can be calculated as the losses of nitric acid or its derivatives, and are monitored for environmental and quality purposes. HNO3_physical is the summation of the following losses:

- nitrates contained in the aqueous waste (monitored for waste water regulation);
- nitrates in the by-products (glutaric acid, succinic acid) (monitored for quality);
- nitrates in the adipic acid production (monitored for quality control);
- NO_X in the reaction off gases (monitored for air regulation)

Typically, physical losses are only in the order of a few percent (2 to 3%) of the total nitric acid consumption with the first two items being of the most important significance.

HNO3_chemical can then be calculated with a good accuracy. For a specific process (with a given catalyst system and oxidation temperature conditions), this consumption is highly dependent of the cyclohexanone / cyclohexanol feedstock used. In a plant where the quality of the feedstock is stable, the chemical consumption is constant.

By-products from nitric acid consumption are N_2O and N2 that are released with the reaction off-gases. For pure cyclohexanol, the ratio of N_2O to N2 is in the order of 0.96 to 0.04 per volume, thus

$$N_2O\_/ AdOH = HNO3\_chemical / P\_AdOH / 63 / 2 \times 0.96 \times 44 \qquad \textbf{(4)}$$

The baseline emissions rate, N_2O_/ AdOH, must be capped at KE_N_2O = 0.27 kg N_2O/kg adipic acid, which is the low end of the range given in the IPCC Good Practice Guidance. If the calculated value of N_2O_/ AdOH is higher than KE_N_2O, it must be replaced by KE_N_2O**.**

Project emissions

The emissions due to project activity in a year y (PEy) are the emissions due to the by-pass of the decomposition facility (Q_N_2O_by-passing), the emissions of N_2O non-decomposed in the decomposition facility (ND_N2Oy) and the emissions due to the natural gas use.

$$PEy = Q\_N_2O\_by\text{-}passy \times GWP\_N_2O + ND\_N2Oy \times GWP\_N_2O + Q\_NGy \times E\_NGy \qquad \textbf{(5)}$$

Where:

The quantity of N_2O not destroyed (ND_N2Oy) is obtained by constantly monitoring the flow (Q_GE) and the concentration (N_2O_GE) of the gaseous effluent of the decomposition process

$$ND\_N_2O = Q\_GE \times N_2O\_GE\ .$$

The quantity of N_2O by-passing the decomposition facility is obtained by constantly monitoring if the N_2O waste gas feeds the decomposition facility

$$Q\_N_2O\_by\text{-}passy = (Q\_N_2O \times (1 - \%\_on\text{-}line))\ y.$$

The quantity of natural gas used by the destruction process is Q_NGy (in standard cubic metres) and E_NGy is the emissions coefficient for natural gas combustion measured (in tonnes CO_2 equivalent per standard cubic metre of natural gas).

The amount of project emissions in the project boundary PEy in a year y can therefore be expressed as:

$$PEy = ((\ Q\_N_2O \times (1 - \%\_on\text{-}line))\ y + (Q\_GE \times N_2O\_GE\ )y) \times GWP\_N_2O + Q\_NGy \times E\_NGy \qquad \textbf{(6)}$$

Leakage

Leak emissions comprise the emissions associated with the energy sources used to generate any steam and electricity used by the decomposition plant.

Leakage amounts to:

$$Ly = Q\_Powery \times E\_Powery + Q\_Steam\_cy \times E\_Steam\_cy \qquad \textbf{(7)}$$

Where

Q_ Powery is the electricity consumption of the decomposition facility.

E_Powery is the CO_2 emission factor of the power generation, and is taken as the highest of the average operating margin and the build margin calculated according to ACM 0002 for the grid connected to the facility.

Q_ Steam_cy is the steam consumption of the facility.

E_Steam_cy is the CO_2 emission factor of the steam generation, and is taken as the emission factor of the plant from which the steam is purchased.

Emission Reductions

The greenhouse gas emission reduction (ERy) achieved by the project activity in a year y is the baseline emissions of the adipic acid plant less the greenhouse gas emissions generated by the decomposition process (PEy) less leakage due to the decomposition process (Ly).

$$ERy = BEy - PEy - Ly$$

Where ERy, PEy and Ly are measured in tonnes of CO_2 equivalent (t CO_2 eq.).

$$\begin{aligned}ERy = {} & Q\_N2Oy \times GWP\_N_2O + Q\_Steam\_py \times E\_Steamy - \\ & - ((Q\_N_2O \times (1 - \%\_on\text{-}line))\, y + (Q\_GE \times N_2O\_GE)y) \times GWP\_N_2O + Q\_NGy \times E\_NGy - \\ & - Q\_Powery \times E\_Powery + Q\_Steam\_cy \times E\_Steam\_cy\end{aligned} \qquad \mathbf{(8)}$$

Additionality

The additionality test consists in confirming and providing evidence to support each of the following three conditions:

Condition 1. There is currently no existing regulation that will require, as of the beginning of the crediting period, that facilities must undertake N_2O abatement.

Condition 2. The project activity is not common practice in relevant sector and region.

Condition 3. The project activity would not be commercially viable even taking into account the market value of any by-products of the decomposition plant.

The additionality test must be repeated for each credit period renewal.

Instructions for testing these additionality conditions are as follows, adopted from the "Tool for the demonstration and assessment of additionality" agreed by the Executive Board (Annex 1, EB16), where further details can be found.

Condition 1. *There is currently no existing regulation that will require, as of the beginning of the crediting period, that facilities must undertake N_2O abatement.*

The operation of the facility in a manner that releases N_2O to the atmosphere must be in compliance with all applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions. (This sub-step does not consider national and local policies that do not have legally-binding status.).

If this statement is true, then Condition 1 is satisfied.

Condition 2. *The project activity is not common practice in relevant sector and region.*

Confirming and providing evidence that the project activity is not common practice involves the following sub-steps:

Sub-step 1. Analyze other activities similar to the proposed project activity:
Provide an analysis of any other activities implemented previously or currently underway that are similar to the proposed project activity. Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc. Other CDM project activities are not to be included in this analysis. Provide quantitative information where relevant.

Sub-step 2. Discuss any similar options that are occurring:
If similar activities are identified in sub-step 1, then it is necessary to demonstrate why the existence of these activities does not contradict the claim that the proposed project activity is additional. This can be done by comparing the proposed project activity to the other similar activities, and pointing out and explaining essential distinctions between them that explain why the similar activities enjoyed certain benefits that rendered it financially attractive (e.g., subsidies or other financial flows) or did not face the barriers to which the proposed project activity is subject.

Essential distinctions may include a serious change in circumstances under which the proposed CDM project activity will be implemented when compared to circumstances under which similar projects where carried out. For example, new barriers may have arisen, or promotional policies may have ended, leading to a situation in which the proposed CDM project activity would not be implemented without the incentive provided by the CDM. The change must be fundamental and verifiable.

If sub-steps 1 and 2 are satisfied, i.e. similar activities cannot be observed or similar activities are observed, but essential distinctions between the project activity and similar activities can reasonably be explained, then the project activity satisfies Condition 2.

If sub-steps 1 and 2 are not satisfied, i.e. similar activities can be observed and essential distinctions between the project activity and similar activities cannot reasonably be explained, then the project activity does not satisfy Condition 2.

Condition 3. *The decomposition plant would not be commercially viable even taking into account the market value of any by-products of the decomposition plant, but not taking into account revenue from the sale of certified emission reductions (CERs).*

To conduct the investment analysis, use the following sub-steps:

Sub-step 1. Determine appropriate analysis method
Determine whether to apply simple cost analysis, investment comparison analysis or benchmark analysis. If the CDM project activity generates no financial or economic benefits other than CDM related income, then apply the simple cost analysis (Option I). Otherwise, use the investment comparison analysis (Option II) or the benchmark analysis (Option III).

Sub-step 2a. – Option I. Apply simple cost analysis
Document the costs associated with the CDM project activity and demonstrate that the activity produces no economic benefits other than CDM related income.

If it is concluded that the proposed CDM project activity is not financially attractive then Condition 3 is satisfied.

Sub-step 2b. – Option II. Apply investment comparison analysis
Identify the financial indicator, such as IRR, NPV, cost benefit ratio, or unit cost of service most suitable for the project type and decision-making context.

For comparison, identify realistic and credible alternative(s) available to the project participants or similar project developers that provide outputs or services comparable with the proposed CDM project activity. These alternatives are to include:

- The proposed project activity not undertaken as a CDM project activity;
- All other plausible and credible alternatives to the project activity that deliver outputs and on services with comparable quality, properties and application areas;
- If applicable, continuation of the current situation (no project activity or other alternatives undertaken).

Sub-step 2c. – Option III. Apply benchmark analysis

Identify the financial indicator, such as IRR, NPV, cost benefit ratio, or unit cost of service (e.g., levelized cost of electricity production in $/kWh or levelized cost of delivered heat in $/GJ) most suitable for the project type and decision context. Identify the relevant benchmark value, such as the required rate of return (RRR) on equity. The benchmark is to represent standard returns in the market, considering the specific risk of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer. Benchmarks can be derived from:

- Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert;
- Estimates of the cost of financing and required return on capital (e.g. commercial lending rates and guarantees required for the country and the type of project activity concerned), based on bankers views and private equity investors/funds' required return on comparable projects;
- A company internal benchmark (weighted average capital cost of the company) if there is only one potential project developer (e.g. when the project activity upgrades an existing process). The project developers shall demonstrate that this benchmark has been consistently used in the past, i.e. that project activities under similar conditions developed by the same company used the same benchmark.

Sub-step 3. Calculation and comparison of financial indicators (only applicable to Option II and Option III):

Calculate the suitable financial indicator for the proposed CDM project activity and, in the case of Option II above, for the other alternatives. Include all relevant costs (including, for example, the investment cost, the operations and maintenance costs), and revenues (excluding CER revenues, but including subsidies/fiscal incentives where applicable), and, as appropriate, non-market cost and benefits in the case of public investors.

Present the investment analysis in a transparent manner and provide all the relevant assumptions in the CDM-PDD, so that a reader can reproduce the analysis and obtain the same results. Clearly present critical techno-economic parameters and assumptions (such as capital costs, fuel prices, lifetimes, and discount rate or cost of capital). Justify and/or cite assumptions in a manner that can be validated by the DOE. In calculating the financial indicator, the project's risks can be included through the cash flow pattern, subject to project-specific expectations and assumptions (e.g. insurance premiums can be used in the calculation to reflect specific risk equivalents).

Assumptions and input data for the investment analysis shall not differ across the project activity and its alternatives, unless differences can be well substantiated.

Present in the CDM-PDD submitted for validation a clear comparison of the financial indicator for the proposed CDM activity and:

(a) The alternatives, if Option II (investment comparison analysis) is used. If one of the other alternatives has the best indicator (e.g. highest IRR), then the CDM project activity can not be considered as the most financially attractive;
(b) The financial benchmark, if Option III (benchmark analysis) is used. If the CDM project activity has a less favourable indicator (e.g. lower IRR) than the benchmark, then the CDM project activity cannot be considered as financially attractive.

Sub-step 2d. Sensitivity analysis (only applicable to options II and III):

Include a sensitivity analysis that shows whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis provides a valid argument in favour of additionality only if it consistently supports (for a realistic range of assumptions) the conclusion that the project activity is unlikely to be the most financially attractive (Option II) or is unlikely to be financially attractive (Option III).

If after the sensitivity analysis it is concluded that the proposed CDM project activity is unlikely to be the most financially attractive (Option II) or is unlikely to be financially attractive (Option III), then the project satisfies Condition 3.

Approved monitoring methodology AMXXXX

"Monitoring Methodology for decomposition of N_2O from existing adipic acid production plants""

Source

This methodology is based on the N_2O Emission Reduction Project in Onsan, South Korea, whose baseline study, monitoring and verification plan and project design document were prepared by MM Pascal Chalvon Demersay / Rhodia Energy and Patrick Rossiny / Rhodia Group / Rhoditech and with the expertise of Mr Axel Michaelowa from Perspective Climate Change / Hamburg / Germany on behalf of Rhodia Polyamide Co. Ltd. For more information regarding the proposal and its consideration by the Executive Board please refer to case NM0061: "N_2O Emission Reduction Project in Onsan" on http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

Applicability

This methodology is applicable to projects which decomposes N_2O from adipic acid production plants under the following conditions:

- Either catalytic or thermal decomposition of the N_2O by-product of adipic acid production at existing production plants.
- The methodology is spatially generic, being applicable across regions where the data (both related to baseline and project activity as well) exist to undertake the assessments.
- The methodology is applicable only for the existing (by the start of project activity) production capacity (measured in tonnes of adipic acid per year) at this plant, which is defined as the maximum (annual) production of adipic acid during any one of the previous three (3) years operating history between beginning of the year 2000 and the end of the year 2004.

This monitoring methodology shall be used in conjunction with the approved baseline methodology AMXXXX ("Baseline Methodology for decomposition of N2O from existing adipic acid production plants").

Monitoring Methodology

Baseline parameters to be monitored include:

- total amount of adipic acid production
- emissions factor of N_2O per tonne of adipic acid produced,
- indirect CO_2 emissions by the steam that will be produced by the decomposition plant[1].

Monitoring of project emissions depend on the operation mode of the decomposition plant, which determines the main data to be monitored (see also Table below). The project emissions to be calculated are:

- N_2O emissions due to the by-pass during downtimes of the decomposition plant (Q_N_2O_by-pass),
- non-decomposed N_2O emissions in the exhaust gas of the decomposition plant (ND_N_2O),

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[1] The steam generated by the decomposition facility will allow reducing of the production of steam by the local supplier.

- direct CO_2 emissions from the natural gas used in the N_2O decomposition facility (CO_2_NG) calculation from the amount of natural gas input (inside the project boundary)
- indirect CO_2 emissions by electric power consumed in the decomposition facility (CO_2_Power)
- indirect CO_2 emissions by steam consumed in the decomposition facility (CO_2_Steam_c) (outside the project boundary).

The physical quantities directly measured in the project boundary are:
- the natural gas input to the decomposition equipment (Q_NG),
- the exhaust gas flow (Q_GE),
- the N_2O concentration in the exhaust gas (N_2O_GE).
- opening time of the valve(s) on the feed line (%_on-line),

The time of connection of the adipic acid plant with the decomposition plant is determined by the time of opening of the valve of the feed line (which is a measure of the abatement system usage factor) with the by-pass valve being closed. Where more than one flow is connected to the decomposition facility, during transition phases when one of the connecting valves is not opened or one of the bypass valves is not closed, as a conservative approach the time of connection will be counted as zero.

CO_2 from decomposed VOCs represents less than 0.02 % of the baseline emissions and will not be calculated and monitored.

The monitoring methodology also requires the examination of local regulations regarding N_2O abatement on a yearly basis. If a regulation is introduced, the possible impact on the calculation of baseline emissions shall be considered without delay as specified in the baseline methodology.

GHG categories to be monitored			
		Inside Boundary	**Outside Boundary**
		Gas (source)	**Gas (source)**
Baseline Scenario	**Non-negligible (monitored)**	N_2O (production of adipic acid)	CO_2 (steam generation: energy industries / energy demand)
	Negligible (not monitored)		N_2O (steam generation)
Project Scenario	**Non-negligible (monitored)**	N_2O (leaked from production of adipic acid) CO_2 (fuel combustion:)	CO_2 (power generation, energy industries) CO_2 (steam generation: energy industries / energy demand)
	Negligible (not monitored)	CO_2 (VOC destruction)	N_2O (power and steam generation)

	Not included	GHGs associated with the facility construction	macroeconomic indirect effects

2a. Data to be collected or used in order to monitor emissions from the project activity, and how this data will be archived.

ID number (Please use numbers to ease cross-referencing to table 5)	**Data type**	**Data variable**	**Data unit**	**Measured (m), calculated (c) or estimated (e)**	**Recording frequency**	**Proportion of data to be monitored**	**How will the data be archived? (electronic/ paper)**	**For how long is archived data kept?**	**Comment**
2a.1. Q_GE	Volume	Effluent gas	m3/h	Measured continuously	Monthly	100%	Electronic	Project lifetime	
2a.2. N_2O_GE	Concentra-tion	N_2O in gaseous effluent	ppm[2]	Measured continuously	Monthly	100%	Electronic	Project lifetime	Measured using gas chromatography in the 0 – 5000 ppm range
2a.3. ND_N20	Mass	N_2O in gaseous effluent	kg-N_2O	Calculated from Q_GE and N_2O_GE	Monthly	100%	Electronic	Project lifetime	
2a.4. Q_NG	Mass	Natural Gas Burning	kg	Measured	Monthly	100%	Electronic	Project lifetime	Measured using a natural gas meter
2a.5. CO_2_NG	Mass	CO_2 from natural gas burning	kg-CO_2	Calculated from Q_NG	Monthly	100%	Electronic	Project lifetime	
2a.6. %_on-line	Time	Connecting valve open	% of production time	Measured continuously	Monthly	100%	Electronic	Project lifetime	
2a.7. Nameplate capacity	Mass	Adipic acid production	kg	Manufacturer's specifications	Once at time of submission of PDD	100%	Electronic	Project lifetime	
2a.8. Q_N_2O_ by-pass	Mass	N_2O bypassing the decomposition facility	kg	Calculated from Q_N_2O and %_on-line	Monthly	100%	Electronic	Project lifetime	Q_N_2O is item 2b.2. used to monitor the baseline of anthropogenic emissions.

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[2] For calculation of N2O in gaseous effluent it should be transformed in kg/m3 units

2b. Data to be collected or used in order to monitor the baseline of anthropogenic emissions for the project activity, and how this data will be archived.

Monitored data for baseline emissions within the boundary (GHG)

ID number (Please use numbers to ease cross-referencing to table 5)	**Data type**	**Data variable**	**Data unit**	**Measured (m), calculated (c) or estimated (e)**	**Recording frequency**	**Proportion of data to be monitored**	**How will the data be archived? (electronic/ paper)**	**For how long is archived data kept?**	**Comment**
2b.1. P_AdOH	Mass	Adipic acid production	tonne AdOH	Measured	Monthly	100%	Electronic	Project lifetime	Production of adipic acid with the decomposition facility connected
2b.2. Q_N_2O	Mass	Quantity of N_2O produced	kg-N_2O	Calculated by multiplying P_AdOH by N_2O_/ AdOH	Monthly	100%	Electronic	Project lifetime	N_2O_/ AdOH is calculated annually and is capped by a value of KE_N_2O = 0.3.
2b.3. Q_N2Oreg	Mass	Allowed N_2O emissions	kg	Calculated	At date of introduction or change of regulation	100%	Electronic	Project lifetime	Depends on regulation
2b.4. N2Oreg/AdOH	Mass	Allowed N_2O emissions / kg of adipic acid produced	kg	Calculated	At date of introduction or change of regulation	100%	Electronic	Project lifetime	Depends on regulation
2b.5. ry	Ratio	Share of N_2O emissions required to be destroyed	%	Calculated	At date of introduction or change of regulation	100%	Electronic	Project lifetime	Depends on regulation
2b.6. PN2O	Monetary value	Market price of N_2O	€/t	Estimated	Annually	100%	Electronic	Project lifetime	Level at factory gate

ID number (Please use numbers to ease cross-referencing to table 5)	**Data type**	**Data variable**	**Data unit**	**Measured (m), calculated (c) or estimated (e)**	**Recording frequency**	**Proportion of data to be monitored**	**How will the data be archived? (electronic/ paper)**	**For how long is archived data kept?**	**Comment**
2b.7. Q_Steam_p	Energy	Steam production by the decomposition process	kg-steam	Measured	Monthly	100%	Electronic	Project lifetime	Metered
2b.8. E_Steam	Intensity	CO_2 intensity for steam[3]	kg-CO_2 /kg-steam	Calculated	Yearly	100%	Electronic	Project lifetime	Calculated from the steam supplier data.
2b.9. CO_2_Steam_p	Mass	CO_2 emissions from steam produced	kg-CO_2	Calculated	Yearly	100%	Electronic	Project lifetime	Calculated using Q_Steam_p, and E_Steam.

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[3] This CO2 intensity is related to the steam produced by the existing supplier and that will be produced by the project.

3. Potential sources of emissions which are significant and reasonably attributable to the project activity, but which are not included in the project boundary, and identification if and how data will be collected and archived on these emission sources

Monitored data for project emissions outside of the boundary (GHG)

ID number	Data Type	Data variable	Data unit	Measured (m) calculated (c) estimated (e)	Recording frequency	Propor-tion of data moni-tored	How will data be archived? (electronic/ paper)	For how long is archived data kept?	Comment
3.1. Q_Power	Energy	Electric consumption by the decomposition process	kWh	Measured	Monthly	100%	Electronic	Project lifetime	Metered
3.2. E_Power	Intensity	CO_2 emission factor of the electricity generation	kg-CO_2 /kWh	Calculated	Yearly	100%	Electronic	Project lifetime	Calculated using latest statistical data of electricity grid
3.3. CO_2_Power	Mass	CO_2 emissions from electricity generation	kg-CO_2	Calculated	Yearly	100%	Electronic	Project lifetime	Calculated using Q_Powery and E_Powery
3.4. Q_Steam_c	Energy	Steam import	kg-steam	Measured	Monthly	100%	Electronic	Project lifetime	metered
3.5. E_Steam_c[4]	Intensity	CO_2 emission factor of steam imported	kg-CO_2 /kg-steam	Calculated	Yearly	100%	Electronic	Project lifetime	Calculated from the steam supplier data.
3.6. CO_2_Steam_c	Mass	CO_2 emissions from steam import	kg-CO_2	Calculated	Yearly	100%	Electronic	Project lifetime	Calculated using Q_Steam_c and E_Steam.

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[4] This CO2 intensity is related to the steam that will be used by the decomposition facility that may be at a different pressure than the one produced by the decomposition facility: E_Steam_c could be different of E_Steam.

4. Assumptions used in elaborating the new methodology:

The CO_2 emission factor of the power generation are to be calculated as the highest of the average operating margin and the build margin calculated according to ACM0002.

The CO_2 emission factors for steam production at the plant and steam consumption by the plant are to be calculated from the CO_2 emissions of the existing steam boilers.

5. Quality Control (QC) and Quality Assurance (QA) Procedures

Data	**Uncertainty Level of Data (High/Medium/Low)**	**Are QA/QC procedures planned for these data?**	**Outline explanation how QA/QC procedures are planned**
2b.1. P_AdOH	Low	Will be obtained from production records of the facility where the N_2O waste originates	
2a.7.; 2b. 2. Q_N_2O	Low	Yes.	
2a.3. ND_N20	Low	Will be measured from the gas effluent of the destruction process	
2a.4. Q_NG	Low	Will be measured using natural gas meter	
5.1. Q_Power	Low	Will be measured using electricity meter	
3.4. Q_Steam_c	Low	Will be measured using steam meter	
2.b.7. Q_Steam_p	Low	Will be measured using steam meter	
2a.8. Q_N_2O_by-pass	Low	Will be measured using opening of a connecting valve	

The quantitative relative scale of the baseline emission and the project emissions from the decomposition facility is around the order of 10^2 by the use of the best available technologies for the destruction of emissions. So the quality control of Q_N_2O and Q_N_2O_by-pass dominate the uncertainty range of whole emission reductions.

In order to control the quality level of Q_N_2O, the quantity of N_2O by-produced that is sent to the N_2O facility during normal operation of the adipic acid plant will be estimated yearly from nitric acid consumption by the Operational Entity. This will be capped to a maximum N_2O emission rate of 0.27 tonne N_2O/tonne adipic acid for the project.