

When Carbon Traders Block the CDM Board

Or

How technological factors with no relevance for the Kyoto Protocol are utilized to engage a competition between CDM developers

	NM111	NM117	NM126	NM143
Plant owner	Abu Qir Fertilisers, Egypt	Sinopec, Nanjing, China	NFL Nangal India	F&C Haifa, Israel
Supplier	Uhde	BASF	BASF	Heraeus
NM status	approved	revision	rejected	
CER / year	597,000	662,153	357,291	76,071
CDM developer	Carbon Entwicklung GmbH	Carbon Ventures	Carbon Ventures	N.serve

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1.) CDM Regulation between Meth Panel and CDM Developers

CDM is also called the "Kyoto Surprise" (Grubb 1999: 226) because it combines *national* emission obligations and *project or plant based* emission reductions. This combination is still a source of ambiguity. Some CDMs are pursued on a micro-economic basis, where CDM participants take approval from the DNA for granted (India). Others pursue CDMs based on national economic policy and strategic assessments of sustainability opportunities (China). These CDMs continue to co-exist.

For CDM projects to proliferate and achieve substantial emission reductions, supra-national bodies and business have to find new forms of cooperation. Environmental regulations have a long history and the regulatory bodies and companies share national traditions. Regulation between supra-national bodies and global businesses is an entirely different matter. As one would expect, the regulatory side tends to think in legalistic and policy argumentation terms, whereas businesses consider operational concerns of costs and opportunities.

For CDMs in industry, this difference is strong and can result in unwanted and unforeseeable dynamics between CDM proposals and Meth Panel decisions. In the fertilizer industry, CDM developers must use a large set of plant operations know-how and experience of commercial relations between plant operators and technology providers. For the regulators in the Meth Panel, this know-how and experiences certainly exist, however their task is to follow Kyoto Protocol terms and continue to account for the climate policy positions of the governments who mandate them to the Meth Panel. For example, the process parameters of the ammonia burner can be manipulated to increase the amount of N₂O formed and thus the regulatory body has to object, although for a plant operator this possibility is purely theoretical because the concern for the core process part, the platinum catalyst, has far more financial implications and overrides any N₂O formation issue. The intricacies of catalyst reaction kinetics translate very badly into emission regulations.

Finally it is important to recall that the Meth Panel has a limited scope of interpretation and frequently has to refer methodological questions up to the CDM Executive Board even so they are purely technical in nature only because the Meth Panel cannot link the technical detail to the terms in the Kyoto Protocol. At times, the CDM Executive Board cannot regulate either and refers again up to the next Conference of Parties (COP/MOP).

2.) Desk Review by Brodmann on NM111 (Uhde)

Carbon Entwicklung submitted NM111 together with additional information not requested in the PDD and NM forms, concerning technical and economic conditions in fertilizer production. Notably "the room for gaming" was problematised and the overriding concerns for production volumes stressed. The technical details in the additional information figured prominently in the following Desk Review but the Desk Review used quite different economic data concluding that CER income was between 4 and 21 % of fertiliser sales, where Carbon Entwicklung had suggested CER income would be only 1.4 %. Certainly the Desk Review data added to the reasons for concentrating on the gaming possibilities.

http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_38753483 - page 2

A. 1. Evaluation of the proposed new baseline methodology:

b. Major changes:

>>1) The baseline N₂O emissions rate per tonne of nitric acid produced should be capped at a conservative level, in order to minimize the incentive for plant operators for increasing N₂O formation in the ammonia burner via operational parameters. Specify the time period for which the cap applies (e.g. cap on yearly average emissions rate). Caps should be differentiated by production technology.

2) In order to become applicable to project activities in new facilities, the methodology would need to be modified as follows:

- The methodology should provide for a convincing demonstration that no other production technology with lower N₂O formation would be installed in the absence of the project activity. Only then will the proposed ex post measurement of N₂O formation result in an adequate baseline for new plants.

- Alternatively, the baseline N₂O emissions rate for new plants may be predefined ex ante, based on a convincing identification of the most likely technology scenario in the absence of the project activity.

- In any case, the risk of CER revenues leading to a shift of nitric acid production from Annex-1 to non-Annex-1 countries should be addressed.<<

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B (3) Assessment of the description of the proposed methodology and its applicability

>>For project activities in new installations, the methodology is not adequate, as discussed in Section 2. For project activities in existing installations such as the one described in the PDD, the proposed

methodology is adequate in principle. Its main weakness is due to the fact that N₂O formation in the

ammonia burner depends also on operational parameters (pressure, temperature, type and replacement rate of catalysts, plant load factor), and not just on technical design parameters (S9). Consequently, the ex post monitoring of N₂O formation invites for gaming the baseline by "optimizing" the operational parameters of the ammonia burner for maximum N₂O formation.<<

(6) Key assumptions/parameters (including emission factors and activity levels) and data sources:

>> 1) The methodology implicitly assumes that CDM registration will have no influence on the amount of N₂O formed in the ammonia burner, which define the baseline emissions. This assumption is not adequate, since CER revenues may provide an incentive to maximize N₂O formation (within the limits defined by other operational parameters), both in the context of technology investment decisions and in day-to-day operations. See Sections 2 and 3 above for details.

2) The methodology states that N₂O, once formed in the ammonia burner, is 100% stable and passes

through all subsequent steps of the production line unchanged. This assumption seems not plausible given the relatively high temperatures and pressures as well as traces of platinum found in and downstream of the ammonia burner, which are clearly conducive to a partial decomposition of N₂O (S12).

In practice, this decomposition may indeed be negligible for the end-of-pipe (tertiary) destruction

technologies targeted by the methodology, since they are located close to the stack.

Nevertheless, the

methodology should require measurements or other evidence to demonstrate that in the absence of the

destruction facility, no relevant decomposition of N₂O occurs downstream of the sampling point where the baseline emissions are determined (i.e. downstream of where the inlet of the destruction facility will be located). See desk review Brodmann of NM0117, Section 2.b), for details on the decomposition of N₂O.<<

Following the Desk Reviews, Meth Panel 17 recommended the changes identified by Brodmann and Carbon Entwicklung resubmitted the methodology on 1. October 2005 with the recommendations incorporated. The subsequent Meth Panel 18, then approved the NM111 with the following arguments:

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>>To exclude the possibility of manipulating the process in order to maximize CERs generation, the operating range of temperature and pressure at the gauzes are determined by: historical data, or if not available, data operating manual, or if also not available, literature. Outliers of historical data are eliminated by statistical methods. If the actual average daily operating values are outside the permitted range, then the baseline emissions are capped by the most conservative IPCC values.

The composition of the ammonia oxidation catalyst and the ammonia flow rate to the oxidation reactor are also monitored to avoid manipulating the process in order to maximize CERs generation, and the baseline emissions are capped for out of range values. The composition of the catalyst should be common practice in the region, or has been used in the plant during the last three years previous to the project.<<

Carbon Entwicklung's baseline and methodology NM111 was thus approved after the query on gaming by the reviewers was incorporated in the PDD, by capping the CER generation for gauze temperature and pressure, catalyst composition and ammonia flow rate outside historical data.

The questions about downstream decomposition were also mentioned by requiring measurements to show that no decomposition occurs downstream of the sampling point near the stack.

Due to a formal procedural rule, Meth Panel 18 requested textual changes and Meth Panel 19 then gave the recommendation for final approval by the Executive Board Meeting 23, February 2006.

While the decision on NM111 was pending, the CDM developer Carbon Entwicklung commented via the Kyoto Secretariat's website on the competitor's methodology NM117. These comments were added to the Website during the Public Input Period (24 June to 14 July 2005) before the official Desk Reviews were published. None of the detailed comments from Carbon Entwicklung were taken up in the Desk Reviews on NM117.

3.) Carbon Entwicklung's critique of Carbon Venture NM117 and NM 126 (BASF China and India)

117: BASF technology at Sinopec plant

5 bar ammonia oxidation reactor, 1,100 t/d nitric acid

http://cdm.unfccc.int/UserManagement/FileStorage/MCFI_PAMethodologies_673588111

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>>Variations in N₂O concentration may occur across the large cross-sectional area of the ammonia oxidation reactor. A spuriously high N₂O baseline may be calculated if there is a local increase in N₂O concentration due to local defects in the gauzes such as can be caused by poisoning or ammonia bypassing through torn gauzes.

There is no *a priori* reason for assuming a fully uniform velocity profile of the reactor gas over the cross-section of the zone between the ammonia oxidation gauzes and the N₂O destruction facility. Non-uniform flow, in combination with varying N₂O concentrations over the cross-section, will lead to a falsification of the overall mean N₂O concentration.

A non-uniform velocity profile may arise for any of the following reasons:

- Wall effects
- Local heaping or breakage of the destruction facility catalyst after repeated expansions and contractions of the reactor basket due to start-ups and shut-downs
- Irregularities below the gauzes, such as the internals of the process gas cooler like the central, non-gas-permeable cylindrical core that is a design feature of the frequently encountered La Mont boiler
- Imperfections in the design of the ammonia-air mixture flow straightener in the hood of the ammonia oxidation reactor. (The ammonia-air mixture arrives in the hood of the reactor by via a small diameter pipe with a 90° bend and has to be spread over the much larger cross-section of the ammonia oxidation reactor. Flow straightener designs vary according to plant capacity and technology licensor.)<<

126: BASF technology at NFL plant

3,25 bar ammonia oxidation reactor, 560 t/d nitric acid

http://cdm.unfccc.int/UserManagement/FileStorage/MCFI_PAMethodologies_155757857

Comments on the proposed new baseline methodology:

>> Weaknesses:

The proposed methodology has substantial and critical weaknesses:

- A) The ex-post determination of baseline emissions by a measurement period of four weeks after start up following the installation of new noble metal gauzes can result in an overestimation of the baseline N₂O emissions and is therefore not in compliance with paragraph 45(b) of the CDM modalities and procedures.

In the conversion of NH₃ and air to NO, the N₂O is a by-product, thus the N₂O formation is inversely correlated to the NO conversion. Theoretically (subject to unchanging process parameters such as pressure, temperature, and throughput) three phases may be distinguished over a gauze campaign:

1. It is well known that after start-up with new gauzes, the NO conversion rises to a maximum not immediately, but after a period of a few days to approximately 2 weeks, depending on the operating conditions as well as geometry and activation of the gauzes. Conversely the rate of N₂O formation decreases.
 2. After phase 1, NO conversion theoretically starts to decrease slightly which conversely results in an increase in N₂O formation, mainly due to PtO₂ evaporation and RhO₂ formation.
 3. Towards the end of the campaign, mainly due to an increased RhO₂ formation as deposits on the Pt wires, the NO selectivity drops rapidly, and there is a concomitant and distinct increase in N₂O formation.
- B) The proposed measuring method does not consider certain plant and process parameters such as plant throughput and gauze temperature and pressure, which vary according to the season of the year and to the operation conditions. These parameters will influence the N₂O formation. Therefore the proposed methodology can result in an overestimation of the baseline N₂O emissions and is therefore not in compliance with paragraph 45(b) of the CDM modalities and procedures
- Diurnal variations in ambient temperature and pressure result in short term fluctuations in gauze temperature and pressure, which influences N₂O emissions. In addition, the usual way to maintain the conversion toward the end of a campaign in spite of catalyst deactivation and losses, is to raise the gauze temperature.
 - The plant load will normally not be kept constant over a campaign due to seasonal and diurnal variations in ambient temperature and pressure and varying market demand. Reduced plant load will result in significantly reduced N₂O emissions.
- C) Over time an increasing amount of platinum will be lost from the gauzes and in part deposited on downstream equipment. This platinum catalyses the decomposition of N₂O; thus even a plant that is not fitted with a N₂O destruction facility will tend to emit less N₂O as time goes by. The baseline established once before the initial installation of the N₂O destruction facility is therefore too high and not conservative.
- D) The N₂O formation depends significantly on the composition, geometry and configuration of the noble metal gauzes. Even between gauzes of the same kind from the same manufacturer variations in N₂O formation may be observed. Furthermore, the business as usual technical progress in gauze efficiency (increase in NO conversion; decrease in N₂O formation) is not taken into account. These influences are completely ignored by the proposed methodology and will unavoidably result in an overestimation of the baseline N₂O emissions.<<<

Process parameters presented:

Citation of Norsk Hydro Patent to show that N₂O decomposes further in gas phases and of Johnson Matthey that platinum is deposited on downstream equipment and so the baseline is not conservative. Brodmann cited Air Liquide instead of Johnson Matthey to point to the gradual platinum loss.

In NM126 all weaknesses relate to the non-conservativeness of the baseline, even referring to the BASF records used in the PDD. Whereas in NM117, in addition to the non-conservativeness, measurement problems are identified, relating to the variations of gas velocities across the gauzes. Four different reasons for the flow measurement problems are cited.

4.) Reviews of Carbon Venture NM117 and NM126 (China and India)

Reviews by Matsuo

http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_174781772

Matsuo requests no major changes and asserts that the direct measurement assures the necessary conservativeness. Queries concern the impact on energy consumption, leakage and flowmeter calibration and accuracy.

Reviews by Brodmann (submitted on the same day as his review of NM111)

117: BASF technology at Sinopec plant

5 bar ammonia oxidation reactor, 1,100 t/d nitric acid

http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_530640485

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>>2) Another key assumption is that N₂O, once formed in the ammonia burner, is 100% stable and passes through all subsequent steps of the production line unchanged. This assumption seems not plausible for the following reasons:

– N₂O decomposes into N₂ and O₂ at temperatures over 575°C and atmospheric pressure. Pressurized N₂O can already decompose at temperatures equal or greater than 300° (Source: S12, Section 10). In nitric acid production, ammonia is typically oxidized at temperatures between 750 and 900 °C (S9, p.8.8-1), and tail gas temperature is reported to be 420°C in the case of NM0111 (S14, p.7). Pressures can vary in a wide range depending on the plant design. For mono-pressure processes, technology supplier UHDE (S8 p.6) indicates 4–12 bar while EPA (S9 p.8.8-3) indicates 1–14 bar. For the first stage in dual-pressure processes, UHDE indicates 4-6 bar and EPA indicates <1- 4 bars. –

Traces of the platinum used as catalyst in the ammonia burner are likely to be deposited downstream (see e.g. S13, p.39). Platinum can accelerate the decomposition of N₂O (S12).

Overall, the environment (temperature, pressure, traces of catalysts) in and downstream of the ammonia burner of nitric acid plants seems clearly conducive to a partial decomposition of N₂O after

formation, i.e. after the platinum gauzes of the ammonia burner. This puts into question whether the measurement of N₂O concentrations immediately after the platinum gauzes, as proposed by the methodology, provides an adequate indicator of the baseline emissions at the stack. In the absence of any corrections for downstream decomposition, this approach is likely to lead to an overstatement of the baseline emissions.<<

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>>1) The uncertainty of N₂O analysis in the reactor gas should be addressed in more detail:

- Is it possible to reliably sample and analyze reactor gas at the prevailing harsh conditions (high temperature, pressure, corrosiveness)?
- Specify minimum availability rate for the sampler and on-line analyzer;
- Location and minimum number of sampling points, since reactor gas will not necessarily be well-mixed immediately after the gauzes.
- Uncertainty of N₂O analyses as well as gas flow measurements and calculations should be substantiated in Section B.7. How low (in % at given confidence interval) is “low” uncertainty?

2) The methodology calculates reactor gas flow by simply adding the flows of ammonia and reactor air. This does not seem adequate since the main chemical reaction in the ammonia burner (oxidation of ammonia to nitric oxide) involves an increase in molecules and hence gas flow (at norm conditions):
 $4 \text{NH}_3 + 5\text{O}_2 \rightarrow 4 \text{NO} + 6 \text{H}_2\text{O}$ (formula from S9)

Note that this error in the methodology, if not corrected, would lead to an underestimation of the reactor gas flow and hence baseline emissions.<<

126: BASF technology at NFL plant

3,25 bar ammonia oxidation reactor, 560 t/d nitric acid

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A.1.b. Major changes:

>>- The base period for determining the baseline emissions rate (currently 4 weeks prior to implementation of the N₂O destruction facility) must be justified in detail, taking into account the need to be representative and conservative.

- Gaming of the baseline emissions rate during the base period must be avoided. To this end, all parameters through which the plant operator can maximize the N₂O emissions rate in the base period must be controlled. Key parameters influencing the N₂O emissions rate include, but may not be limited to: Type of gauzes (catalyst); Plant load factor; Temperature; Pressure. These parameters must be monitored during the base period, and shown to be consistent with earlier (historic) data.

- The baseline emissions rate should account for technological progress in the absence of the CDM project activity, i.e. for improvements in catalyst gauzes resulting in increased NO yields and reduced N₂O emissions.

- The baseline emissions rate should account for continued deposition of platinum downstream of the ammonia burner, and for how this would influence N₂O emissions in the baseline.

- During the crediting period, the specific volume of stack gas (in m³ per t of nitric acid) must be monitored and compared with values from the base period and historic values, in order to avoid inflation of the baseline through increases in specific volume of stack gas. In case the specific gas volume in the crediting period deviates from that in the base period, the ex post calculation of absolute baseline emissions must be adjusted. Provide formula for this purpose.<<

Process parameters presented:

Matsuo posed questions on flowmeters and their calibration but only as an unreasonable source of uncertainty and not as a concern to conservativeness. The flowmeter question does not distinguish between ex ante and ex post measuring and does not reflect flow measurement uncertainties due to the gauzes.

For conservativeness, Matsuo queried the influence of future gauze improvements. She agreed that the NM126 ex ante measurement (BASF India) would be very conservative and claims that there is a contradiction between Carbon Venture's assertion that the more conservative ex ante measurement would also be more accurate than the ex post one. Brodmann also saw the influence of future gauze improvements but he judged that gaming due to the normal wear on the gauzes is a more serious violation of the conservativeness principle. Since Brodmann saw the downstream decomposition and gauze changes in relation to the conservativeness of the baseline, he judged ex ante measurement as superior to ex post measurement. Consequently, Brodmann acknowledged that ex ante measurement allows for less "gaming" but queried the specific gaming possible with ex ante measurement.

Overall, Brodmann is more critical of NM117 and NM126 than Matsuo because Brodmann assumed that gaming and downstream decomposition requires MAJOR CHANGES to assure baseline conservativeness. Matsuo is more favourable since she only reacted to the flowmeter instrumentation, secondary effects on energy consumption and leakage.

Following the reviews by Matsuo and Brodmann, Meth Panel 17 requested clarifications from Carbon Ventures. Carbon Ventures then submitted a revised PDD and methodology for NM117, referring explicitly to the criticism:

<http://cdm.unfccc.int/UserManagement/FileStorage/Q28NDLWC8T4KMBQVX7NVHLH5RKAUU>

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Potential Decomposition of N₂O after the gauze.

It has been suggested that there is a significant potential for decomposition of N₂O after the gauzes. Normally, after catalytic oxidation of ammonia at a temperature level of 850-950°C the nitrous gases are directly cooled in a heat recovery section (equipped with amongst others a catchment for Pt/Rh from the catalytic gauze). Significant decomposition of N₂O will only occur at elevated temperatures of 850-950°C if given time and this can only be achieved by extending the reactor chamber by at least 3 metres before the heat recovery section. This system known as **Thermal decomposition – extended reactor chamber** was developed by Norsk Hydro developed an extended reactor chamber by increasing the space between the platinum catalyst gauge and the heat recovery section, thus providing an increased residence time of 1 to 2 seconds (see sketch below). A plant in Norway equipped with an extended reaction chamber resulted in a nitrous oxide level in the tail gas of about 200 ppmv, equivalent with a N₂O reduction of approximately 70%. (information source MARKET ANALYSIS DeN₂O Jacobs Engineering Nederland Document no. : 63578-0302 Issue 2 : May 2001 15 EmissionCare\\Herder\Project Bestanden\1001 - ECN\Marktanalyse\Rapportage\Market analysis DeN₂O - publication 2.doc)

In existing nitric acid plants the effective chamber length after the cooling bundles is usually in the range 30 to 40cms and not 3 metres before the cooling bundles as in the Norsk example and therefore the gas temperature has already been cooled significantly down to 230°C. Given the significantly reduced gas temperature in this bottom part of the reactor and the small retention time the potential for significant reduction in N₂O is minimal likewise the potential for any significant reduction in N₂O due to noble metal deposits in the nitric acid train is also insignificant due to the low gas temperatures. In fact tail end catalysts (Tertiary catalyst) for the abatement of N₂O (NM0111) needs a temperature of at least 420 c to be effective and this is with the gas passing over a fully loaded bed of catalyst. **Further in the BASF plant at Lud wigshafen which is approx 35 years old BASF have since March 1999 been measuring N₂O concentrations continuously from sample points installed between the noble metal gauze and the secondary N₂O catalyst (ie before N₂O destruction), directly underneath the reactor basket and at the outlet of the in the tail pipe. (refer picture 3)**

Their results for N₂O concentration from the sample point at the outlet of the reactor show that there is as expected no further abatement of N₂O occurring through out the nitric acid train after the secondary catalyst. However to ensure that we err on the side of caution and address an issue we believe to be insignificant we will:

Prior to the installation of the secondary catalyst we will in addition to the sample points to be installed between the noble gauzes and the secondary catalyst located in the reactor basket and in the tail gas after any SCR for the removal of NO_x **install** an additional sample point after the secondary catalyst installation underneath the reactor (burner) basket

After N₂O Secondary Catalyst installation.

We will measure and record all N₂O process data from the three sample points and the amount of N₂O reduction claimed will be adjusted for any difference in N₂O concentrations observed from the extra sample point installed in the nitric acid reactor under the secondary catalyst and the sample point in the nitric acid plant tail gas. Any N₂O reduction that can be shown to have occurred between the sample point underneath the secondary catalyst installation and the tail gas sample point will not be due to the secondary catalyst and would occur anyway. If any such abatement can be shown to be occurring then the amount of N₂O reduction claimed will be adjusted accordingly.

In this revised PDD Carbon Ventures cited the NM111 and the N₂O decomposition at various temperatures. Carbon Ventures also refers to the Norsk Hydro technology which was first mentioned in the comments by Carbon Entwicklung. Likewise, Carbon Ventures also added information regarding the flow distribution across the gauzes stating that "Ruskin rings" are widely used in fertilizer plants to maximize nitric acid production. The revised PDD also included a picture of the sampling point before the DeN₂O catalyst. Carbon Venture thus reacted to the Carbon Entwicklung's comments, perhaps assuming that the Desk Reviews had been influenced by these comments. This assumption might be correct but can not be ascertained here.

The most important change in the revised PDD was the use of a third sampling point in the tail gas and the assurance that any difference between the second and the third N₂O sampling point would be considered to occur also without the catalyst and would thus be deducted from the N₂O abatement achieved in the catalyst. Carbon Ventures has thus refuted Carbon Entwicklung's criticism on flow patterns only in rhetoric, but has reacted to Brodmann's downstream decomposition objections by using real time measurements to account for all possible decomposition and in addition to this measurement applies a "generous" deduction. This generousness then backfired.

Meth Panel 18 then rejected NM117 with a note "B" - "to be reconsidered".

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http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_R8JEOZKP8X9HWCP5DO65XF8HECW0JQ

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>>It is assumed that for N₂O, the environment (temperature, pressure, traces of catalysts) in and downstream of the platinum gauzes of the ammonia burner of nitric acid plants may lead to a partial decomposition of N₂O after formation. It has been questioned that measurement of N₂O concentrations immediately after the platinum gauzes, as proposed by the methodology, provides an adequate indicator of the baseline emissions at the stack. In the absence of any corrections for

downstream decomposition, this approach can lead to an overstatement of the baseline emissions. The methodology takes into consideration this effect, and deducts 1% as the N₂O gauze decomposition factor. Though the basis of choosing 1% is not explained.<<

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>> The key source of uncertainty is the error in estimation of N₂O in the baseline scenario (through flow meter reading). The effect can be so large to potentially make some items pointless. Since references on by-product rates typically cite an uncertainty range of 10%, it is assumed that the measurement of reactor gas volume and N₂O concentration could yield a comparative figure. This is not addressed.<<

>> Conservativeness has been substantially increased since the methodology takes into account the effect of pressure and temperature change as well as downstream degradation of N₂O. However, since there is no justification of the level of NDF, it remains to be seen whether this is adequate.<<

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>> The methodology denotes that calibration procedure is to be developed for routine calibration of key parameters. This needs to be more specific, including a description of the instrument, calibration frequency and applicable industry standards. It is not clear as to why the uncertainty level can be explained as being low when the QA / QC procedure is not elaborated, and the amount of N₂O produced can fluctuate with respect to various conditions. Further, the mention on GASMET gas analyzer is specific to the Nanjing project, its mention should be avoided when proposing a methodology (except in case when use of such instrument is necessary for all such projects). Accuracy, uncertainty and calibration method for GASMET analyses is not mentioned.<<

The Meth Panel has thus taken up some of the criticisms by Matsuo and Brodmann. But neither Matsuo, Brodmann nor the Meth Panel has referred to the criticism by Carbon Entwicklung. Where Carbon Entwicklung had suggested wall effects, flow straighteners, and gauze heaping to refer the flow measurement accuracy to the variation of flows across the flow section, the Meth Panel queried the calibration of the instrument and a general uncertainty range of 10 %. Likewise the Meth Panel refers to the GASMET analyzer and requests information on the instruments accuracy. Similarly, neither the Meth Panel, nor Matsuo, Brodmann refer to the decomposition due to lost noble metals (gauzes) as Carbon Entwicklung pointed out.

The Meth Panel acknowledges that Carbon Ventures has increased the conservativeness by deducting a 1% gauze decomposition factor, which Carbon Ventures judged as sufficient to account for the downstream decomposition. However, the Meth Panel wants a justification for that level. The Meth Panel has not taken up Matsuo's questions on leakage and Brodmann's reference to "room for gaming".

Summing up, the Meth Panel takes issue with the accuracy of the key variables, flows and gas composition, irrespective of the specifics of the process. The two revisions of the methodology submitted by Carbon Ventures have not been satisfactory for the Meth Panel.

Following this judgement on NM117 by Meth Panel 18, Carbon Venture's submitted a revised version of NM126, on 13 November 2005. This revised version of NM126 was judged by Meth Panel 19 as altogether unacceptable and thus received a note "C" - "Not to be approved".

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>> A fundamental flaw in this methodology, pointed out in the preliminary recommendation, is not addressed. The baseline emissions, calculated from parameters measured ex ante, is fixed in absolute terms, which could result in a situation where maximum CER is claimed when the facility ceases to operate, which could be due to market conditions or accident, etc. Measurement period is increased to eight weeks rather than four, though it is stated to be conservativeness, no justification or explanation of the same is provided. Though methodology tries to limit the parameters within a certain range, this is useful in addressing the possibility of overestimations. It seems to contradict the assertion of conservativeness that N2O emission is at its lowest at the beginning of a campaign.<<

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>> Measurement period is increased to eight weeks rather than four, and its conservativeness is touted without much justification. It seem to contradict the assertion of conservativeness that N2O emission is at its lowest at the beginning of campaign. However, the real issue is inappropriateness of calculating baseline emissions without any reference to real-time performance of the facility; conservatism is not an issue here.<<

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>> Uncertainty level is assumed to be "low" without explanation. It is also mentioned that calibration procedure is to be developed, but no specifics are given. However, it should also be noted that this is much the same with similar methodologies such as AM0021 and NM0111.<<

The reason for non-approval cited by the Meth Panel is similar to the criticism seen by Matsuo, when conservativeness is claimed to be increased, then there is no need to attempt to increase the accuracy. The qualities of ex ante measurements were already stated in Brodmann's comments on NM111, later restated for NM117 also by Matsuo, and further qualified by distinguishing between gaming during the ex ante measurement and during the production period. It appears that Carbon Ventures attempted during the revisions to increase conservativeness while the Meth Panel was seeking an improved argumentation for the actual level of conservativeness. As in NM117 by adding a general 1% deduction, Carbon Ventures added another 4 weeks for ex ante measurement in NM126 without any justification for the actual degree of modification.

Perhaps Carbon Ventures changed from ex post for NM117 to ex ante measurement of N2O concentrations for NM126 because this was hoped to eliminate the downstream decomposition issue and indeed Matsuo had written originally that ex ante would be more conservative. This was clearly not the view of the Meth Panel. The core reason why NM126 got a rejection from the Meth Panel was a non technical issue, whether the ex ante measurement would allow for N2O abatement claims even when the plant does not operate later on. This core reason is due to a misjudgement of the plant operation, for Carbon Ventures it is self-evident that a plant is not idling when it could operate and for

the Meth Panel whether idling would have to be avoided is simply not the issue, the possibility of doing so is sufficient.

Pretended process parameters in NM126:

The presence of an existing SCR-DeNO_x unit tends to increase rather than decrease the N₂O emissions of a Nitric Acid Plant (Jouannic et al 1994)

Conclusion

Over the course of various comments and revisions of NM117 and NM126, clearly the interpretation of conservativeness was being questioned by all sides and no conclusion appeared. Instead the CDM developer Carbon Ventures sought to find new claims on conservativeness, whereas the Meth Panel wanted to get more evidence for the already made assertions on conservativeness.

In parallel to this disagreement, there was a striking shift during the whole process, which started with reaction kinetics, where N₂O is formed or decomposed, but then shifted to the instruments for flow and gas composition. This shift has no clear cause since nowhere is there any reference to a comparison of the margin of error through the instrument to the error through process changes.

Since there are not other differences between the Nanjing and the Nangal plants (both are medium pressure plants and BASF proposes the same catalyst material and reactor modifications) one could conclude from the different judgement on NM117 than on NM126 that the Meth Panel prefers ex post measurement of the baseline rather than ex ante. That conclusion would be wrong, both types of baselines are allowed and there are no technological reasons why one would be preferable to the other for fertilizer plant. In fact the process parameters in the nitric acid production are so integrated and all normal operations are so predictable that the accuracy of N₂O emission reduction measurement with both calculations is the same. Likewise, both allow to maintain a specific level of conservativeness.

After various non-conclusive rounds of comments and revisions of methodologies for Abu Qir (NM111), Nanjing (NM117) and Nangal (NM126), the next occasion for N₂O CDM comments, criticism and possible clarification of technical judgements is the submission for validation by N.serve for the F&C plant in Israel.

5.) Carbon Venture's critique of N.serve NM143 (Heraeus)

N.serve is a new CDM development company established in Germany. The fertilizer plant in Haifa is quite different from the first three as it operates at 11.7 bar pressure (the reactor diameter is 1 m instead of 6 m for the three other CDMs, flow characteristics are quite different as a consequence). The CDM and its presentation in the PDD stress different issues.

<http://cdm.unfccc.int/UserManagement/FileStorage/U7XN84GAYL16LNOE9F4BPVJFTE8AUE>

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>>N₂O Abatement catalysts

A small number of N₂O abatement options have become available in the past 2 years after some 5 to 10 years of research, development and industrial testing. Only now that N₂O regulation is going to be introduced in the EU by 2007 and with the incentives provided by the Kyoto Protocol nitric acid plant operators start to consider adopting these technologies. N₂O abatement technology is now commercially available from a number of catalyst manufacturers, mainly from Germany and the UK. These technologies are proprietary and will be sold or leased to nitric acid plants under the CDM. Hence, the CDM will enable nitric acid plants in non-Annex 1 countries to become the pioneers of N₂O abatement of the global nitric acid industry.

F&C has determined that it will install a secondary catalyst (upon approval as a CDM project), but is still considering the various options and vendors. Most likely F&C will adopt the technology offered by Johnson Matthey, which is also F&C's supplier of the precious metal gauzes. A wide range of base metals have been found to be effective in the application of N₂O abatement catalysts (Cu, Fe, Mn, Co, Ni, etc.). F&C is most likely to select Johnson Matthey's Amoxis Hybrid™ RN2O/101. This is a catalyst system that consists of the standard precious metal gauze pack that performs the Ammonia Oxidation and an additional base metal catalyst, which is capable of reducing N₂O by at least 80%. This secondary catalyst consists of clover leaf shaped pellets containing a Lanthanum-Cerium-Cobalt-Perovskite. The catalyst system has been tested in a number of industrial trials in European nitric acid plants and no traces of the catalyst material could be detected in the nitric acid product. F&C operates a Wheatherly designed single burner nitric acid plant with an operating pressure of 11.7 bar (high pressure).<<<

Notably NM143 goes into far more detail on the reactor geometry, the changes to the gauzes and to the flow patterns over the course of a production campaign. It gives estimates for the variations and leaves room for further modifications of the N₂O catalyst. Rather than following the technical parameters, the methodology is more oriented to the economic aspects of plant operation and relates conservativeness to very different issues than the three preceding N₂O NMs. N.serve shows that CER revenues would account for 15 % of production costs, within the range indicated by Brodmann and far higher than the information provided by Carbon Entwicklung.

When Carbon Venture put its comments on the Website, it had already received the B note for NM117, but it was still waiting to get the Meth Panel conclusion for NM126. It should be expected that Carbon Venture's comments on NM143 stressed those arguments in NM126 it had most confidence in:

http://cdm.unfccc.int/UserManagement/FileStorage/MCFI_PAmethodologies_197745335

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>>3: The methodology makes the spurious claim without any providing any technical proof that you can not measure accurately the N₂O concentration in the ammonia burner. This is quite an incorrect statement and should be withdrawn as BASF have developed a measurement technique for the measurement of N₂O concentration in the ammonia burner. They have been using this in their Ludwigshafen nitric acid plant in Germany for over 5 years and can demonstrate that the technique gives accurate reading for the N₂O concentrations in the ammonia burner with low variability. It should be left to the project validator using his professional judgement to determine the accuracy of measurement techniques used to measure the concentration of N₂O in the ammonia burner.<<

Carbon Ventures criticises the opportunities for gaming by changing the gauzes, the production level and the N₂O concentration measurement. The point on changing the gauzes could reflect that Carbon Ventures wanted to stress that it's own ex ante baseline measurement during 8 weeks instead of one whole campaign makes little difference for the scope for gaming.

In general, Carbon Ventures queries the inconsistencies between the Meth Panel's recommendations on NM111, NM117 and NM126. However the claim on N₂O measurement accuracy is left as claim since the accuracy achieved at the BASF plant is not substantiated. This point is critical because contrary to Carbon Venture's assumption of the validator's professional judgement, the Meth Panel has to consider that methodologies are as stringent as possible.

Pretended process parameters of gauzes in Carbon Ventures comments:

The manufacturers of such gauzes claim that their new generation of gauzes will decrease the generation of N₂O by up to 35 % over older generations.

6.) Carbon Entwicklung's critique of N.serve NM143 (Heraeus)

http://cdm.unfccc.int/UserManagement/FileStorage/MCFI_PAMethodologies_552039728

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>>At partial load the precious metal gauzes are less heavily loaded than at full load and the proportion of the ammonia feed converted into N₂O is reduced compared with the situation at full plant load. The specific N₂O generation (tN₂O/tHNO₃) at partial load is thus significantly lower than at full load. The difference between the baseline N₂O emission factor (based on measurement over one campaign, presumably at full plant load) and the project emission factor (at partial load) is thus larger than would have been the case if the appropriate, lower baseline N₂O emission factor for partial plant load had been applied and will therefore result in an overestimation of emission reductions under partial plant load conditions.

Reduced plant load will result in significantly lowered baseline N₂O emissions. Therefore the application of the proposed methodology unavoidably results in an overestimation of baseline N₂O emissions (when the plant is operating at partial load) and is therefore not in compliance with paragraph 45(b) of the CDM modalities and procedures.<<

This possibility of gaming has already been addressed in Brodmann's comments on NM111 and Carbon Entwicklung rightly points to the need of capping. Going beyond the capping provisions in NM111, Carbon Entwicklung also claims that

future gauze improvements ought to be accounted for. N.serve's baseline does copy the corrections for outliers as it was applied in NM111 but only during the ex ante establishing of the baseline which represents indeed a reduced level of conservativeness compared to NM111.

With the same phrases as the comments on NM117 and NM126, the decomposition due to lost platinum on downstream equipment is stated as resulting in an overestimation of the baseline. Carbon Entwicklung continues to claim that this should be reflected in the baseline although the Meth Panel has not taken up this point neither for NM117 nor for NM126. Similarly Carbon Entwicklung continues to claim that a financial benefit of an increase in recovered platinum would have to be taken into account.

Carbon Entwicklung also reacted to the Meth Panel's rejection of NM126, because it queries the need to distinguish between downtime and normal operation, in fact copying the major reason for the rejection of NM126 as applying also to NM143. This readiness to exploit any weakness is rather blunt because there is no recognition that NM143 is a high pressure plant with quite different campaign characteristics than NM126.

Pretended process parameters of gauzes:

The comments by Carbon Ventures are more precise, concentrating on the issues which, if NM143 were to be approved, would contradict the methodologies submitted for NM117 and NM126. Carbon Entwicklung's comments are broader, listing all possible issues which could be related to conservativeness.

7.) Mutual references between PDDs and Comments

The procedures of the CDM validation assume that references to the literature are helpful to clarify technical details. In the case of fertilizer plants, this appears not to work, for example, CDM developers and commentators refer to Norsk Hydro's technology and publications while they draw different conclusions. Carbon Entwicklung stressed the downstream composition, while Carbon Venture claimed that this composition requires more time and temperature than is available in the downstream equipment of the same plants.

The original input from Carbon Entwicklung with additional information was very well targeted, stressing the operational constraints for any gaming and linking

the incentive of gaming to the economics of fertilizer production. The Desk Reviewers pursued this further, however the Meth Panel drew quite different conclusion from the same argument.

The core problem of the N₂O CDM validation appears to be that competing CDM developers claim opportunities of gaming to exist which are based on their superior knowledge of the process characteristics and that the Meth Panel is obliged to query all of these opportunities even when plant operators know perfectly well that these opportunities exist only in theory. Since the exact behaviour of the platinum gauzes and the De-N₂O catalyst remains covered by commercial confidentiality provisions, the Meth Panel has no basis to judge the claims on conservativeness.

This problem is made even more difficult because CDM developers and Desk Reviewers refer to each others statements even when these concern fertilizer with quite different operational parameters. It is quite possible that the CDM Board is increasingly in a position where all its decisions are challenged by concerns about inconsistencies between the judgements on all N₂O methodologies.

Carbon Venture addresses the CDM Board directly:

While there is nothing wrong with this approach the issue is the inconsistency experts have taken in assessing other N₂O methodologies were they have agreed to methodology NM0111 using highest historical production if available but restricted NM0117 and NM0126 to using name plate or design production rates.

We could end up with the situation depending on the expert assessment that we have either three methodologies restricted to name plate or design production capacity and one NM0111 being allowed to use highest historical production levels which in most cases will be higher than name plate or design production capacity. We could also end up with two methodologies being allowed to use highest or maximum historical production. By allowing this to occur the methodology panel has in effect given a significant commercial advantage to the suppliers of tertiary or tail end N₂O catalyst technologies and commercially disadvantaged to date secondary catalyst suppliers which I am sure was never the intention.

http://cdm.unfccc.int/UserManagement/FileStorage/MCFI_PAMethodologies_197745335

Meth Panel summary recommendation to the Executive Board for NM117, page 2:

7. Any other issues arising to be stated, if necessary (e.g. cross-cutting, general or precedent-setting issues raised by the proposed new baseline or monitoring methodology).

It is the view of the Panel that NM0111 (originally developed for tertiary destruction) is better prepared with a potential for application to secondary destruction.

Meeting on 17 – 19 October 2005

http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_R8JEOZKP8X9HWCP5DOG5XF8HECW0JQ