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**Report of the individual review of the CLRTAP and NEC air emission
inventory of Country Xxxx
submitted in 2005¹**

¹ In the symbol for this document, 2005 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Overview

A. Introduction

1. This report covers the trial centralized review of the 2005 air emission inventory submission to CLRTAP and NEC of Xxxx for SO₂, NO_x, NMVOC and NH₃ for the years 1990 - 2003, coordinated by a trial review secretariat. The trial centralized review was planned at the 15th TFEIP meeting, in October 2005, as agreed by the EMEP Steering Body at its twenty-ninth session.

2. In this first year, the review is a trial process to help further develop the draft methods and procedures² for stage 3 and to help Parties to understand the potential needs and usefulness of a future detailed review of Parties' CLRTAP inventories. The review has been performed in accordance with existing draft methods and procedures document². All participant countries have volunteered experts and/or reported material to be reviewed. In an attempt to assess the full usefulness of the review and the implications of review on the guidelines and guidebook, the material reviewed is beyond that strictly mandated by the Protocols and includes additional reported material including the informative inventory report (IIR) and non mandatory data provided by Parties.

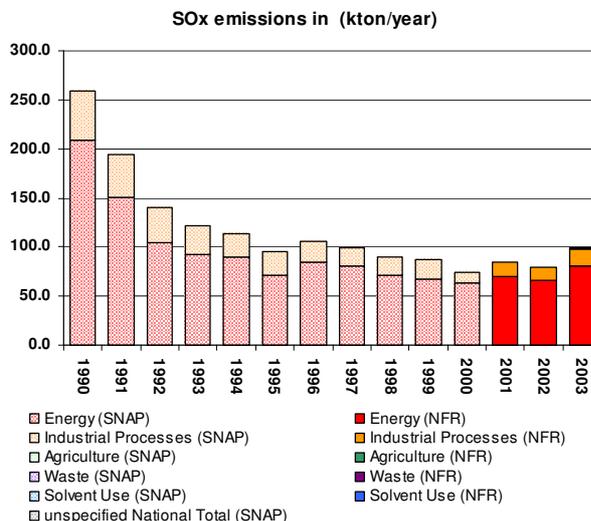
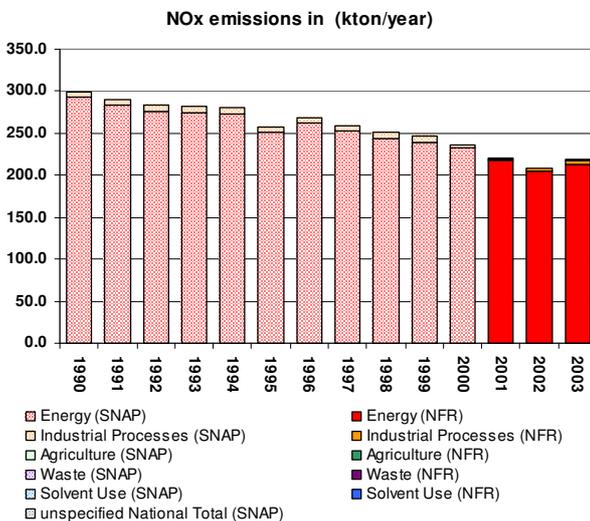
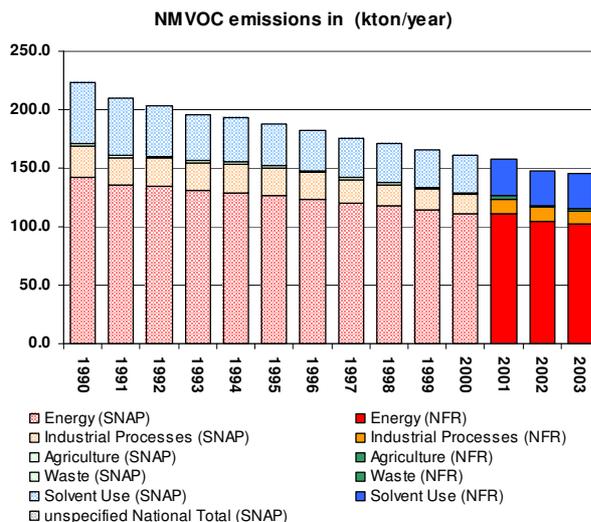
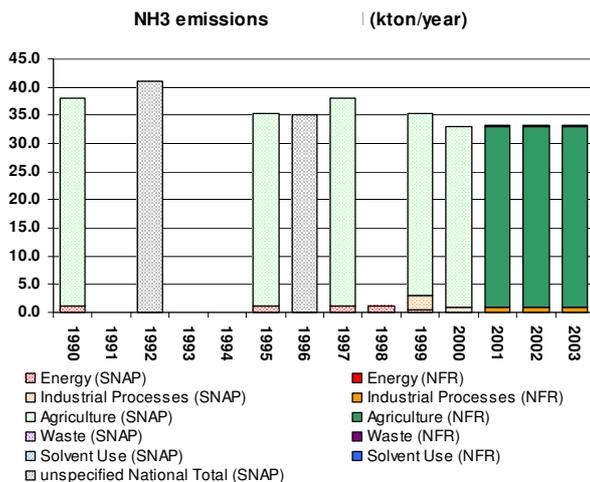
3. The review took place from 27th of February to 3rd of March 2006 in Copenhagen, Denmark, and was conducted by the following team of experts nominated by the volunteering participating countries: Generalist –Mr. Justin Goodwin (United Kingdom); Energy –Mr. Tomas Gustafsson (Sweden), Mr Tinus Pulles (ETC/ACC), Mr Stephan Poupa (Austria); Industrial Processes – Ms. Zuzana Elenicova (Slovak Republic), Ms Jitka Hlavicova (Czech rep), Ms Kristina Saarinen (Finland); Agriculture –Mr. Chris Dore (United Kingdom), Mr. Steen Gyldenkaerne (Denmark); Mr. Justin Goodwin and Mr. Tinus Pulles were the lead reviewers. The review was coordinated by Ms. Karin Kindbom (trial review secretariat).

4. In accordance with the draft "Guidance for reviewers", a draft version of this report was communicated to the Government of Xxxx, which provided comments that were considered and incorporated, as appropriate, in this final version of the report.

B. Inventory submission and other sources of information

5. In its 2005 submission, Xxxx submitted data for the years 2001 –2003 in the NFR format and provided an Informative Inventory Report (IIR). National emission totals in SNAP format are available for the years 1990 – 2000 for NO_x, NMVOC and SO₂. Emissions of NH₃ were delivered in SNAP for 1990 1995, 1997, 1999 and 2000 and as national total for 1992 and 1996. For 1998 only NH₃ emisisions from energy are reported. The graphs below provide an overview. The charts show the most up-to-date time series reported between 1990 and 2003 to the UNECE under CLRTAP. The pale colours have been used to illustrate the sectors reported in the old SNAP format while the bolder (darker) colours represent data reported in the new NFR format. Reporting of national totals only, is represented by a white bar on the chart.

² The EMEP Steering Body, at its twenty-ninth session welcomed the 'Draft methods and procedures for the technical review of air pollutant inventories' reported under the Convention and its Protocols (EB.AIR/GE.1/2005/7, annex III), as developed by the TFEIP. These were subsequently adopted by the EMEP Executive Body at the 23rd session (ECE/EB.AIR/87).



6. The review concentrates on the years where data were submitted in the NFR format.

C. Emission profiles and trends

7. The emission contributions from the different sectors for 2003 are shown in the table below with their % emission changes since 1990. For all pollutants except probably NH3 reported emissions decreased significantly since 1990. Since however the formats of the reports are different no detailed analysis is possible.

	NH3		NMVOC		NOx		SO2	
	% in 2003	1990 -2003 reduction						
Energy	0%	-99%	71%	-28%	97%	-28%	82%	-61%
Industrial Processes	3%	NE	8%	-57%	2%	2%	17%	-66%
Agriculture	97%	-13%	NE	NE	NE	NE	NE	NE
Waste	NE	NE	1%	1%	0%	133%	0%	93%
Solvent Use	0%	NE	20%	-44%	0%	NE	1%	NE
Total (1990-2003 reduction %)	100%	-13%	100%	-35%	100%	-27%	100%	-62%
Total in 2003 (Gg)		33.18		145.19		218.68		98.81

D. Key sources

8. Xxxx has performed a comprehensive Tier 1 level key source assessment for eighteen pollutants, including the ones reviewed in this report. The key source analysis performed by the party provided similar results as the one performed by the secretariat.

9. The IIR states that in addition a Tier 2 key source analysis is performed, using the output of the uncertainty analysis. The IIR does not provide information on how the results of the key source analysis are used. A trend key source analysis is announced in the IIR for the next submission. The ERT proposes Xxxx to use the results of the key source analysis in for prioritizing inventory improvements.

E. Main findings

10. Xxxx submitted a well developed inventory in NFR format for the years 2001, 2002 and 2003. These data appear to be generally consistent with data for earlier years, submitted in SNAP format. The NIR accompanying this submission is clear and well structured. Xxxx is rapidly developing a mature emissions reporting system and procedures and is able to produce the information in a consistent and well organised way. The ERT is quite confident that Xxxx will be able to report also the years 1990 to 2000 in the NFR format, as indicated in the IIR. Detailed findings and comments are given in the sector chapters below.

F. Cross-cutting topics

1. Completeness

11. The number of times Xxxx is using the notation key "NE" is very limited for all pollutants. Xxxx's inventory therefore is almost complete. The report clearly states what sources are not included and provides an explanation for that. Detailed comments are provided below in the sector chapters

2. Transparency

12. Given the high quality of the Xxxx IIR and the clear presentation of all methods used, the Xxxx inventory can be considered as generally transparent.

3. Recalculations and time-series consistency

13. Xxxx is recalculating the emissions while moving to the new NFR reporting format. A separate chapter in the IIR clearly describes this process. From the time series analysis, performed by the ERT (see paragraph 5), it seems that this transformation keeps time series consistency untouched.

4. Uncertainties

14. Xxxx performed a Tier 2 uncertainty analysis for eighteen pollutants reported in the inventory, including the ones reviewed in this report. The IIR provides detailed information on the assumptions made and the uncertainty ranges used for both the activity data and the emission factor. The ERT proposes Xxxx to indicate whether this information is used for planning inventory improvements.

5. Verification and quality assurance/quality control approaches

15. The ERT noted that Xxxx is implementing a comprehensive QA/QC system, including a formal quality management system, archiving, verification and external review. The ERT encourages Xxxx to continue along this route and to assess the possibilities to get the quality management system certified.

6. Follow-up to previous reviews

16. This is the first review under the LRTAP convention and the NEC Directive.

G. Areas for further improvement

1. Identified by the Party

17. Xxxx has undertaken special projects to identify possible improvements in its inventory. This process is well embedded in the Xxxx QA/QC approach in the inventory.

2. Identified by the ERT

18. The ERT identifies the following cross-cutting issues for improvement:

- (a) to implement a formal and certified quality management system
- (b) to use the results of the uncertainty analysis in the planning of inventory improvements.

19. Recommended improvements relating to specific source/sink categories are presented in the relevant sector sections of this report.

II. Energy

A. Sector overview

20. In Xxxx the share of the energy sector to national total emissions of the four pollutants, included in this review is presented in the table below. In 2001 and 2003 the energy sector caused almost 100% of the reported emissions of NO_x and SO₂. The share of the energy sector in the emissions for NMVOC is about 70% in both years. The energy sector does not contribute significantly to the emissions of NH₃.

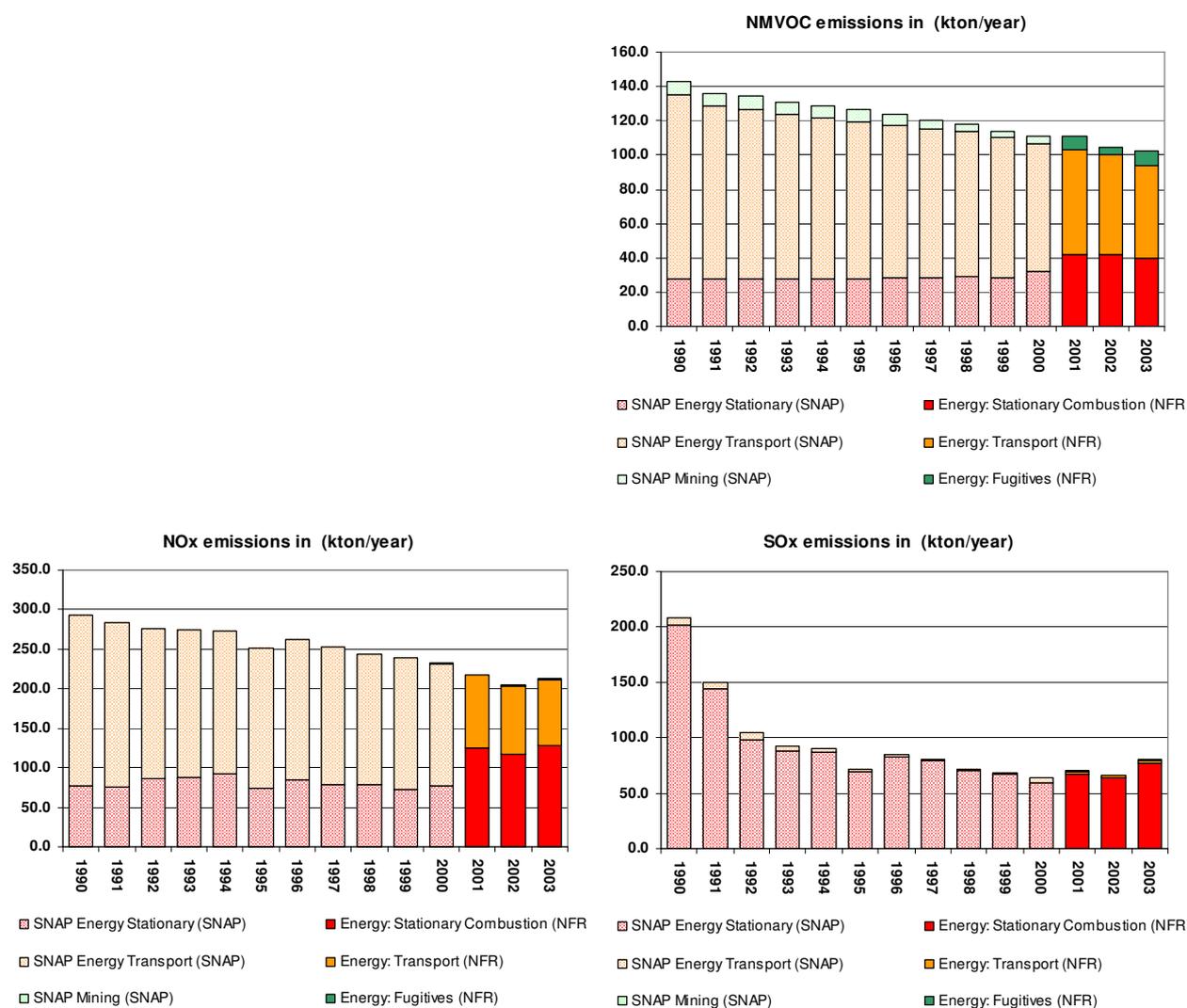
Pollutant emission in Mg	1990			2003		
	National total	Energy sector	percentage	National total	Energy sector	percentage
NH ₃	38.00	1.20	3.2%	33.18	0.01	97.0%
NMVOC	223.80	142.70	63.8%	145.19	102.44	45.0%
NO _x	298.80	293.70	98.3%	218.68	212.31	96.0%
SO ₂	258.63	208.30	80.5%	98.81	80.56	5.0%

21. Xxxx reported detailed data for the years 2001, 2002 and 2003 in NFR and 1990 – 2000 in SNAP. The emissions from the energy sector have changed as shown in the table below. The emissions of SO₂ decreased with 61%, the emissions of NMVOCs and NO_x decreased by 28 %.

Pollutant	2001	2003	Change in emissions from energy(%)
	Energy sector	Energy sector	
NO _x	142.70	102.44	-28%
NMVOC	293.70	212.31	-28%
SO _x	208.30	80.56	-61%

22. Within the energy sector contributions from different subsectors are presented in the following graph. Road transport is the largest contributor to NMVOC emissions. Emissions of NO_x are partly from stationary sources and partly from mobile sources. Emissions of SO_x are dominated by contributions from energy in industrial combustion (refineries, power plants and energy use in industry). The decrease

in emissions of NMVOCs between 2001 and 2003 is mainly due to decreases in the emissions in the transport sector. The reported emissions of SO₂ are dominated by stationary combustion.



23. Xxxx has reported emissions from the Energy sector for 1990-2000 in SNAP and from 2001 – 2003 in NFR. It is stated in the IIR that data for the years 1990-1999 will be reported in NFR in the 2006 submission. The ERT encourage Xxxx to also include estimates of the main pollutants for the 1980's in its next submission. The ERT notes a shift in attribution of reported NO_x and NMVOC emissions between mobile and stationary sources while transforming to the NFR. The ERT invites Xxxx to look into this in the next submission.

24. Emissions of NMVOC, NO_x and SO₂ are in general reported in 2001-2003. However, the ERT have identified a few missing emission sources in some years - SO₂: 1A1c in 2000-2003, 1A3a i (ii) in 2003, 1A3a ii (ii) in 2001 and 2003, 1A3d i in 2001 and 2003, 1A3d i (i) in 2001-2002, 1A3e i in 2001-2003, 1A5b in 2001-2003, 1B1b in 2002, 1B2a v in 2003; NO_x: 1A3a i (ii) in 2003, 1A3d i in 2001 and 2003, 1A3d i (i) in 2001-2002, 1A3e i in 2001-2003, 1A5b in 2001-2003, 1B1b in 2002, 1B2a iv in 2001, 1B2a v in 2001, 1B2b in 2001-2002; NMVOC: 1A1c in 2001-2003, 1A2a in 2003, 1A2b in 2001

and 2003, 1A2d in 2003, 1A2e in 2001-2003, 1A3a i (ii) in 2003, 1A3d i in 2001 and 2003, 1A3d i (i) in 2001-2002, 1A3e i in 2001-2003, 1A5b in 2001-2003.

25. Emissions of NH₃ from the Energy sector are generally of small quantities. Xxxx has only been reported NH₃ from one source category, 1 A 1 a Public Electricity and Heat Production, in 2003. The ERT recommends Xxxx to complete more calculations of NH₃ emissions from this sector.

26. The Xxxx IIR states that plant specific emission data from Industry are used and are verified against the Xxxx inventory data reported to the UNFCCC. However, there is no information on how the allocation of emissions between the Energy sector and the Industrial sector is done. The ERT recommends that the Party includes information in the next submission on how this split has been handled.

27. The Xxxx NFR tables lack aggregated emissions for the main source categories, e.g. 1A3b Road transportation and 1A4b Residential. The ERT recommends the Party to complete the NFR tables to reach better completeness.

28. The ERT noticed that Xxxx has not reported emissions of NMVOC from some source categories (1 A 2 a Iron and Steel, 1 A 2 b Non-ferrous Metals and 1 A 2 d Pulp, Paper and Print). The ERT encourage the Party to include these emissions in the next submission or use the proper Notation key instead of reporting "0" in the NFR tables.

1. International bunker fuels

29. Xxxx has reported emissions of NO_x, NMVOC and SO₂ from international aviation and navigation. Emissions of NH₃ from international navigation have been reported as "NA". The ERT invites Xxxx to clarify in its next submission this assumption that NH₃ is not emitted from international navigation since the Party has reported such emissions from domestic navigation.

B. Key sources (*fuel combustion and fugitive*)

2. 1A1 Energy Industries, 1A2 Industry – activity data

30. The IIR suggests that activity data is kept as consistent as possible with data used for compiling the GHG-inventory. As activity data of the GHG-inventory is checked by regular UNFCCC reviews a quantification of remaining divergences between the different datasets would be useful to get a feeling of activity data quality.

3. 1A1 Energy Industries, 1A2 Industry – all fuels – all pollutants

31. The IIR suggests that a high share of total emissions from categories 1A1 and 1A2 are reported by plant operators. The ERT proposes that Xxxx provides a quantification of emissions reported by plant operators and those calculated by means of emission factors in future IIRs. To be able to assess the information, an indication of the implementation of abatement technologies could be included. The IIR states that reported point source emission data is checked and approved by the supervising authorities but a more detailed description of these checks would be useful as these seem to be a key issue of data quality, e.g. how are activity/production data, technologies and emissions checked against each other ?

4. 1A3b Road Transport – all fuels – all pollutants

32. The figures of the IIR suggest a strong decrease of all emissions from road transport. The ERT encourages the party to provide activity data and EF to increase transparency of the selected methodology as the hyperlink to the transport-model did not seem to work during the review exercise.

C. Non-key sources (*fuel combustion and fugitives*)

1. 1 A 1 a Public Electricity and Heat Production, 1 A 1 b Petroleum refining: All

In the previous stages of the review, low IEF for Xxxx were identified for emissions of NMVOC from 1 A 1 a Public Electricity and Heat Production (0.0001 kg/GJ), and 1 A 1 b Petroleum refining (0.0006 kg/GJ) compared to regional average IEF (0.0052 kg/GJ and 0.0035 kg/GJ, respectively). Xxxx has responded in previous stages that it may be due to efficient burning. The ERT acknowledge that this might very well be the case, but nevertheless encourage the Party to provide validation of these estimations by explain what type of equipment that is installed and give reasons for any major deviation in EF compared to the Guidebook defaults.

III. Industrial Processes and Solvent Use

A. Sector overview

33. For industrial processes Xxxx has reported SO₂, NO_x and NMVOC emission from the Mineral, Chemical, Metal and Other industries (NFR 2A1, 2A2, 2A7, 2B5, 2C, 2D1, 2D2); for NO_x also from NFR 2B2 and for NMVOC (excluding NFR 2A2). The reported SO₂ emissions from the industrial processes in 2003 were 17 kt (17.34 % of the national total), NO_x emissions were 4.87 kt (2.23 % of the national total), NMVOCs were 11.43 kt (7.87 % of the national total) and the NH₃ emissions were 0.94 kt (2.84 % of the national total).

34. For the Solvent and other product use sector (NFR 3) Xxxx has reported NMVOC, NO_x and SO₂ emissions from all sectors and NH₃ for sectors NFR 3C and 3D. The reported SO₂ emissions from the solvent and product use sector in 2003 were 0.30 kt (0.31 % of the national total), NO_x emissions were 0.23 kt (0.11 % of the national total), NMVOCs were 29.31 kt (20.18 % of the national total) and the NH₃ emissions were 0.15 kt (0.44 % of the national total).

35. The time-series for SO₂, NO_x, NMVOC and NH₃ emissions in the new NFR format is at the moment incomplete as the data are reported in the new NFR format only for the years 2001-2003 and data for the previous years in the old SNAP format. It is therefore not possible to make a thorough estimation of the trends. Xxxx is encouraged to complete the time-series in NFR format also for the earlier years.

36. Xxxx has provided the methodology of emission estimation for all industrial processes and solvent and product use sectors and implied emission factors in IIR. SO₂, NO_x, NH₃ emissions were reported by plants according to the monitoring requirements in the environmental permits. The estimation of NMVOC emissions is based both on data reported by the industry and on calculation with use of emission factors.

37. Xxxx has filled in values or notation keys for 100% of the sectors under NFR 2A, 2A3, 2A4, 2B1, 2B3, 2B4, 2D, 97 % of the sector under NFR 2A1, 2A6, 2D2, 3A, 3B, 3C, 92 % of the sector under 2A7, 2B5. Xxxx is encouraged to complete the values or notation keys for the remaining cells.

B. Key sources

38. For SO₂ NFR 2B2 is a key source with contribution of 6.5 % to the total emission, NFR 2C with 6.3 % and NFR 2D1 with 4.5 %. The emission trend in NFR 2B2 is increasing and there is no explanation which industrial processes are included in this sector in the IIR. The emission trend in the other key sources NFR 2C and 2D1 is increasing too (due to increased production). The ERT recommends Xxxx to explain these trends in the next IIR

C. Non-key sources

1. Xxxx is encouraged to provide information concerning which industrial processes are included in the sectors NFR 2A7 and 2B5.

IV. Agriculture

A. Sector overview

39. The total ammonia emission from agriculture in Xxxx in 2003 has been estimated to be 32.1 Gg in 2003, which represents 97 % of the total reported ammonia emission. Data has been reported in new NFR format for 2001-2003 inclusive. Emission estimates have been reported for previous years, but these are currently in SNAP format. Hence these earlier emission estimates have not been included in this review. The IIR indicates that these historic data will be converted to new NFR for future reporting. All known ammonia sources are reported in relevant categories.

40. PM and TSP emissions from housed animals and agricultural activities in general are reported for 2001-2003 inclusive. Pesticides emissions are reported as "Not Applicable"

41. NO_x and NMVOC emissions from soils are not currently reported, but are flagged in the IIR as sources to be included in the inventory in the near future.

42. Since 2001 the total NH₃ emissions in and NO_x Xxxx from agricultural livestock have remained reasonably constant. Decreases in emissions from cattle have been offset by increased emissions from pigs and fur animals. Emissions from cattle dominate the livestock emissions (accounting for 57% of the national NH₃ total).

43. NH₃ emissions from agriculture are calculated using country specific values from a model which incorporates variables such as N excretion rates, national management practices and volatilisation rates. Emission factors are given in the IIR, and the methodologies are well explained. However, no activity data are provided (e.g. livestock, fertiliser use, arable areas etc.).

44. Notation keys are generally used in accordance with the guidelines although some notation keys are missing - most notably those associated with reporting aggregated data, and this has been addressed through the Stage 1&2 review.

B. Key sources

45. The country specific N excretion rates and resulting NH₃ emission factors are given in the IIR. Comparison of these factors with literature values show some significant differences. The ERT recommends that the reasons for this are clearly explained in the next submission. These factors include:

- (a) Broilers are reported with an N excretion rate of 0.2 kg/animal place/yr compared with a guidebook value of 0.6 kg/animal place/yr.
- (b) N excretion rates indicated for horses are considered to be high- 65 kg of N/year reported compared with a default CORINAIR guidebook value of 50 kg of N/year. This will result in a relatively high NH₃ emission factor, but the quoted country specific value in the IR is even higher than this N excretion value would suggest.

46. The IIR indicates some areas for improvement. The ERT encourages Xxxx to indeed review these issues in future submissions:

- (a) N volatilisation percentages reported in Table 79 of the IIR show volatilisation from both storage and application to be high compared with data from the literature. The IIR does indicate that these will be reviewed in the near future.

- (b) Manure applied to the soil from pasture range and paddock is currently reported under Manure Management (4B). The IIR correctly identifies that these emissions should be reported under 4D, but doesn't indicate when or if a correction might be made.

47. A volatilisation rate of 1% is assumed for synthetic fertiliser application (0.5% if injection), but there is no differentiation for application of different fertiliser types. The Review Team recommends that this improvement is incorporated for future reporting (although information on the consumption of different fertiliser types will be needed to accomplish this).

48. PM emissions from housed livestock and agricultural activities are reported to LRTAP, but only the latter are covered by the IIR. The Review team suggest that the methodology for estimating emissions from housed livestock is included in the IIR in future.

C. Non-key sources

49. Field burning is reported in the IIR as a known source which is currently not reported. It is hoped that this source can be included in future reporting.

Annex [I]

Documents and information used during the review

A. Reference documents

UNECE, 2003. Emission Reporting Guidelines, Air Pollution Studies No 15.

Draft methods and procedures for the technical review of air pollutant emission inventories reported under the Convention and its protocols. Annex III of EB.AIR/GE.1/2005/7

EMEP/CORINAIR Emission Inventory Guidebook (<http://reports.eea.eu.int/EMEPCORINAIR4/en/>)

EMEP/CORINAIR Emission Inventory Guidebook. Chapter on Good Practice Guidance for CLRTAP Emission inventories (<http://reports.eea.eu.int/EMEPCORINAIR4/en/BGPG.pdf>)

Guidance for Reviewers (draft, prepared for this trial centralized review).

Protocol requirements for countries (prepared by the UNECE Secretariat)

Vestreng, V. et.al. Inventory Review 2005 - Emission data reported to LRTAP Convention and NEC Directive. EMEP Technical Report 1, 2005.

Review report 2005 for Country Xxxxx (from stages1&2 review of 2005 submission)

Officially submitted data to the UNECE LRTAP Convention secretariat (submitted before March 10 2005) and Informative Inventory Report, submission 2005 from Country Xxxxx

B. Additional information provided by the Party

Responses to questions during the review were received from [Ms.][Mr.] XXX (organization) including additional material on the methodology and assumptions used

[Annex 2]

[Supplementary information]

If, in exceptional circumstances, additional space is needed to provide important supplementary information to the main part of the report, the review team may use this annex. Please limit the annex to that information necessary to clarify specific issues, with reference to the relevant section of the report. Also keep in mind that detailed information on issues identified should be recorded in the review transcript. Please make efforts to avoid the use of this annex and keep the length of the review report within the limits set by the review guidelines.
