ENVIRONMENT AGENCY AUSTRIA umweltbundesamt

Austria's Inventory Adjustment Report 2017

Austria's applications for inventory adjustment pursuant to Article 5 (1) of the NEC Directive 2016/2284 (Addendum to Austria's IIR 2017)

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The information covered refers to the following accreditation scope of the IBE: EMEP/CORINAIR Emission Inventory Guidebook 2009, EMEP 2013 and EMEP 2016 (www.bmwfw.gv.at/akkreditierung)

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This final version of the report replaces the draft that was submitted to the European Commission on 15 March 2017 (report REP-0613). The new version of the report includes corrected NO_x amounts of the national totals for compliance in chapters 2.2 and 2.3.

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CONTENT

1 INTRODUCTION

Following the NEC Directive Article 5 – Flexibilities, Member States may establish, in accordance with Part 4 of Annex IV, adjusted annual national emission inventories for sulphur dioxide, nitrogen oxides, non-methane volatile organic compounds, ammonia and fine particulate matter where non-compliance with their national emission reduction commitments would result from applying improved emission inventory methods updated in accordance with scientific knowledge.

Annex IV, Part 4, includes three broad categories under which adjustments to the national emission inventories may be applied:

- New emission source categories are identified which were not included in the relevant historic national emission inventory at the time when emission reduction commitments were set;
- The emission factors used for determining emission levels for specific source categories at the time when emission reduction commitments are to be attained significantly differ from the original emission factors used when the emission reduction commitments were set;
- The methodologies used for determining emission levels for specific source categories have undergone significant changes since the time when the emission reduction commitments were set.

Following the NEC Directive 2016/2284 Article 5 (5) Members States that intend to apply paragraph 1, 2, 3 or 4 shall inform the Commission thereof by 15 February of the reporting year concerned. That information shall include the pollutants and sectors concerned and, where available, the magnitude of the impacts upon national emission inventories.

2 ADJUSTMENT APPLICATION

2.1 Notification

Austria informed the Commission on 15 February 2017 in an official letter (file *Erledigung_BMLFUW-UW.1.3.3_0012-I_4_2017_15.02.2017_.pdf*) that it proposed an adjustment to its national emission inventory in accordance with Article 5(1) for

- NO_x emissions 2010, 2011, 2012, 2013, 2014 and 2015 from sector transport, based on significantly different methodologies, and
- NH_3 emissions 2010, 2011, 2012, 2013, 2014 and 2015 from sector agriculture, based on new emission source categories,

due to an exceedance of the national emission ceilings. On 15 March 2017 Austria submitted supportive information pursuant to the NEC Directive (EU) 2016/2284 Annex IV Part 4 (including this document and a supporting report "Assessment of transport emissions in Austria for the year 2015 based on emission factors from HBEFA1.2 and HBEFA3.2").

2.2 Evidence that the relevant national emission reduction commitments are exceeded

The 2010 emission ceiling for **nitrogen oxides** emissions for Austria, based on the National Emission Ceilings Directive (EU) 2016/2284 repealing Directive 2001/81/EC, is 103 kilotonnes. According to the latest inventory, NO_x emissions in Austria were 149.42 kt in 2010, 146.16 kt in 2011, 141.16 kt in 2012, 138.43 kt in 2013, 132.64 kt in 2014 and 131.74 kt in 2015, as reported in Austria's inventory submitted on 15. February 2017. These figures were calculated on the basis of fuels used (cf. paragraph 16 of ECE/EB.AIR/97).

The 2010 emission ceiling for **ammonia emissions** for Austria, based on the National Emission Ceilings Directive (EU) 2016/2284 repealing Directive 2001/81/EC, is 66 kilotonnes. According to the latest inventory, ammonia emissions in Austria were 66.53 kt in 2010, 66.05 kt in 2011, 66.15 kt in 2012 and 66.07 kt in 2013, 66.52 kt in 2014 and 66.80 kt in 2015 (source see above).

It should be noted that the emission ceilings have been specified as whole numbers without decimal places (rounded numbers derived from the IIASA model calculations) and that emission values need to be rounded to the nearest whole number in order to compare the emissions against the ceilings. In this case, the NH_3 emissions for compliance assessment were 66 kt in 2011, 2012 and 2013 and did not exceed the ceiling. The European Environment Agency (EEA) however, did not apply this rule in the past and reported these levels as exceedances for all years. This is why Austria is applying for an adjustment to its inventory for NH_3 for all the years from to 2010 to 2015.

2.3 Evidence of the extent to which the adjustment reduces the exceedance and contributes to compliance

For **nitrogen oxides** emissions Austria intends to apply adjustments to its transport inventories from 2010 onwards based on significantly different methodologies. Table 1 and Table 2 show the impact of proposed adjustments for the inventory years 2010 to 2015:

Table 1: Impact of proposed adjustments on Austria's NO_x inventory (non-rounded data)

[kt]	2010	2011	2012	2013	2014	2015
1.A.3.b Road Transport	-26.35	-27.60	-28.28	-28.74	-29.07	-27.55
Total [kt NO_x]	**-26.35**	**-27.60**	**-28.28**	**-28.74**	**-29.07**	**-27.55**

Table 2: Impact of proposed adjustments on Austria's compliance with its NO_x emission ceilings under Directive (EU) 2016/2284 (non-rounded data)

	2010	2011	2012	2013	2014	2015
Austria's emissions according to the best available science (submission 2017)	149.42	146.16	141.16	138.43	132.64	131.74
Applied adjustment (seeTable 1)	-26.35	-27.60	-28.28	-28.74	-29.07	-27.55
Emissions including applied adjustments [kt NO_x]	**123.07**	**118.56**	**112.88**	**109.69**	**103.57**	**104.19**

Following Austria's emission scenario "with existing measures (WEM)" and proposed adjustments Austria will achieve compliance with its NO_x emission ceilings from 2016 onwards.

For **ammonia** emissions Austria intends to apply adjustments to its agriculture inventories from 2010 onwards based on new sources. In applying these adjustments Austria will achieve compliance with its NH_3 emission ceilings (see Table 4)

Table 3: Impact of proposed adjustments on Austria's NH_3 inventory (non-rounded data)

New sources for NH_3 [kt]	2010	2011	2012	2013	2014	2015
3.D.a.2.b Sewage Sludge	-0.22	-0.22	-0.21	-0.19	-0.20	-0.24
3.D.a.2.c Other organic fertilisers (including compost)	-0.67	-0.65	-0.67	-0.66	-0.66	-0.66
Total [kt NH_3]	**-0.90**	**-0.87**	**-0.88**	**-0.86**	**-0.86**	**-0.90**

Table 4: Impact of proposed adjustments on Austria's compliance with its NH_3 emission ceilings under Directive (EU) 2016/2284 (non-rounded data)

	2010	2011	2012	2013	2014	2015
Austria's emissions according to the best available science (submission 2017)	66.53	66.05	66.15	66.07	66.52	66.80
Sum of applied adjustments (see Table 3)	-0.90	-0.87	-0.88	-0.86	-0.86	-0.90
Emissions including applied adjustments [kt NH_3]	**65.64**	**65.18**	**65.28**	**65.21**	**65.66**	**65.90**

2.4 Estimation of whether and when the relevant emission reduction commitments are expected to be attained

For **nitrogen oxides**, Austria's emission scenario "with existing measures (WEM)" shows emissions below 103 kt in the year 2021 (calculation based on "fuels used"). Emissions in the transport sector are heavily influenced by the assumptions regarding the effect of "real world driving provisions" for diesel cars. The emission factors used for the projections are based on the expectation that the EU regulations will have some effect after 2018.

For **ammonia**, Austria's emission scenario "with existing measures (WEM)" includes existing measures which were mainly based on the Austrian Agri-Environmental Programme, period 2014–2020. The programme includes financial compensation for environmental measures such as phase feeding of pigs, promotion of grazing, covering of slurry tanks, improved fertilisation (e.g. band spreading of slurry). Agricultural measures are targeted at a more effective handling, storage and use of manure and mineral fertilisers in order to decrease ammonia emissions.

However, according to current national emission projections using inventory data based on the best available science methodologies, ammonia emissions will increase by 2020 to 70 kt (calculation based on "fuels used"). This is mainly due to national livestock projections which show significantly increased animal numbers of cattle and swine. Additionally, there is an ongoing trend from tie stall housing to loose cattle housing systems in the light of animal welfare considerations, giving rise to considerably higher emissions of ammonia. The sophisticated Austrian air emission inventory for agriculture reflects this by using different emission factors for these two kinds of housing systems. EFs used for loose housing systems are considerably higher (by a factor of 3) than those applied for tie stall systems, resulting in an increase in annual average EFs for cattle farming.

This dynamic development of Austria's NH_3 emissions from cattle housings based on new science was not included in Austria's national emission inventory at the time when the emission reduction commitment was set. The increases in the EFs due to the shift from tie stall to loose housing systems were neither included in the considerations when establishing the national emission ceiling nor in the IIASA RAINS model.

However, Austria decided not to apply for an adjustment regarding the significantly different emission factors from cattle farming in its 2017 submission because its national ammonia emission ceilings will be met if the proposed adjustments for the new sources are accepted. Austria reserves the right to submit another adjustment application at a later date.

2.5 Evidence that the adjustment is consistent with the circumstances specified in the NEC directive, Annex IV

Austria proposes an adjustment to its national emission inventory in accordance with Article 5(1) for **NO_x** emissions 2010, 2011, 2012, 2013, 2014 and 2015 from the transport sector based on significantly different methodologies.

Evidence of consistency with the circumstances defined in the NEC Directive Annex IV Part 4 is documented in Chapter 3 and in an accompanying report.

Austria proposes an adjustment to its national emission inventory in accordance with Article 5(1) for **NH_3** emissions 2010, 2011, 2012, 2013, 2014 and 2015 from the agriculture sector based on new emission sources.

Evidence of consistency with the circumstances defined in the NEC Directive, Annex IV Part 4 is documented in Chapter 4.

3 ADJUSTMENT APPLICATION FOR SIGNIFICANTLY DIFFERENT METHODOLOGIES – TRANSPORT/NO_x

The emission ceilings laid down in Directive 2001/81/EC were derived from model calculations within the RAINS model of the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, which were based on the state of knowledge at the end of the 1990s. Concerning the trend of vehicle specific emissions it was assumed that the emission levels would decrease at the same rate as the emission limits required under the vehicle type approval system.

In the meantime it has been found out that the reductions in vehicle specific NO_x emissions under real world driving conditions are much smaller than expected at the time when the targets were established. The findings are based on test bench measurements which were performed in the course of several studies through international co-operation. The findings apply especially to diesel passenger cars and light commercial vehicles certified according to the emission standards EURO 1 to EURO 6 as well as for heavy duty vehicles from EURO I to EURO V.

Originally a continuous decrease in the average NO_x emission factors for diesel cars from EURO 1 to EURO 4 to less than one third had been expected, whereas according to current knowledge, real world emission factors have even increased for the first EURO stages and then remained at a level comparable to EURO 1 up to EURO 5. Heavy duty vehicles have not shown the expected reduction of emission factors either; according to current knowledge emission factors are 30% up to more than 60% higher than expected for EURO II to EURO IV and more than twice as high for EURO V. It is obvious that these differences represent a significant change.

Austria's inland road transport emissions which are based on the current (and significantly higher) NO_x emission factors are about 50% higher for 2010 and the following years than the emissions based on the original emission factors. The emission factors are taken from the "Handbook of emission factors for road transport" (HBEFA): HBEFA version 1.2 (released in January 1999; basis for the definition of the NEC limits) and HBEFA version 3.2 (released in July 2014; latest reference database including all available in-use emission tests and recent forecasts for upcoming vehicle technology).

The difference is mainly due to the change in emission factors. However, the update of the emission factors in the inventory has been accompanied by an improvement in the way in which emission factors are applied to different vehicle types across the time series. HBEFA 1.2 assumes that as soon as a new EURO class becomes mandatory, 100% of the vehicles entering the fleet belong to that class. In reality, as it turns out, there is a split between the EURO classes of cars entering the fleet. Market entry may be earlier than expected for certain EURO classes (due to an earlier availability of cars belonging to a future EURO class) or later (e. g. due to imports of used vehicles, temporary registrations by vehicle dealers who sell the vehicles later, truck bodies finished after the deadline for the first registration of the vehicle chassis). The current inventory takes into account that vehicles belonging to a previous or future EURO class enter the fleet after or before the due date (quite a small share).

Furthermore EURO 5 and 6 as well as EURO VI were not defined in HBEFA 1.2. For emission calculations based on HBEFA 1.2 the activity data for EURO 5 and 6 and EURO VI vehicles, as used in the current inventory, has to be reallocated to the latest EURO classes available in HBEFA 1.2.

For these reasons, the current adjustment application is not based on "significantly different emission factors" but on "significantly different methodologies". Nevertheless, the "Adjustment calculation template for road transport (Table 11)" from Annex I of the Technical Guidance for Parties Making Adjustment Applications and for the Expert Review of Adjustment Applications (ECE/EB.AIR/130) has been filled in to illustrate the adjustment for the year 2015. As the template was designed for adjustments based on different emission factors only, it has been slightly modified to show - on the one hand - the different assignment of the activities to the EURO classes of a vehicle type, and on the other hand, to show that the total activity data for a vehicle type is identical in the calculations based on both the old and the new emission factors.

All details with respect to the models, emission factors, activities and results can be found in the accompanying report "Assessment of transport emissions in Austria for the year 2015 based on emission factors from HBEFA1.2 and HBEFA3.2. (Report No. Inst 02/17 Rex Em 13/2016-679 from 14.02.2017)".

4 ADJUSTMENT APPLICATION FOR A NEW SOURCE – AGRICULTURE/NH_3

In Austria's NH_3 inventory for agriculture sector the following new sources have been included after the 1999 submission:

- Sewage sludge applied to soils (3.D.a.2.b)
- Other organic fertilisers applied to soils (3.D.a.2.c)

4.1 Sewage sludge applied to soils (3.D.a.2.b)

Sewage sludge applied to soils is considered to be a new source according to the NEC Directive Annex IV Part 4.

Evidence that the new emission source category is acknowledged in scientific literature and/or the EMEP/ EEA Guidebook

The source category "Sewage sludge applied to soils" was introduced to the emission reporting template "NFR14" as a new source for 2015 submissions (→ new NFR source category 3.D.a.2.b). The first EMEP/EEA air pollutant emission inventory guidebook providing specific Tier 1 NH_3 emission factors for sewage sludge application is the version of 2016.

Evidence that this source category was not included in the relevant historic national emission inventory at the time when the emission reduction commitment was set

This source of ammonia was not included in the EMEP/CORINAIR atmospheric emission inventory guidebook, second edition 1999 and third edition 2001. This source was not included in Austria's national emission inventory at the time when the emission reduction commitment was set.

Sewage sludge application was not included in the considerations when establishing the emission ceiling; nor was it included in the RAINS model.

Austria reported NH_3 emissions from sewage sludge application for the first time in its NEC submission of 31st December 2010.

Evidence that emissions from a new source category contribute to a Member State being unable to meet its emission reduction commitments, supported by a detailed description of the methodology, data and emission factors used to arrive at that conclusion

In its NEC submission of 31st December 2010 (time series 1990-2009) Austria included NH_3 emissions from sewage sludge application for the first time. Due to a lack of specific EMEP/EEA default Tier 1 EFs, Austria used a conservative approach by applying the CORINAIR emission factor for urea (0.15 kg NH_3-N/ kg fertiliser N, source: EEA 2007, Table 5.1). In its 2017 submission Austria revised its calculations by using the new EMEP/EEA default Tier 1 NH_3 EF for

sewage sludge application according to the EMEP/EEA emission inventory guidebook 2016, Annex 1 (0.13 kg NH_3/ kg N applied). The revision resulted in an annual decrease by about 0.1 kt NH_3 from 2010 to 2014 in the category sewage sludge application (see IIR 2017, chapter agricultural soils, recalculations).

	2010	2011	2012	2013	2014	2015
Sewage Sludge	0.22	0.22	0.21	0.19	0.20	0.24
AT Total NH_3	**66.53**	**66.05**	**66.15**	**66.07**	**66.52**	**66.80**

Table 5: NH_3 emissions [kt] from sewage sludge application, submission 2017.

National NH_3 emissions show a slight exceedance of the emission limit set out in the NEC Directive for 2010 onwards (66 kt). The proposed adjustments for inventory submission 2017 regarding sewage sludge application would reduce emissions annually by about 0.2 kt NH_3 (see Table 5). Consequently, emission reduction commitments would be met in 2011, 2012 and 2013. With the proposed adjustment compliance in the remaining years 2010, 2014 and 2015 will be achieved if the other proposed adjustments for the source category "Other organic fertilisers applied to soils" are taken into account (see below).

4.2 Other organic fertilisers applied to soils (3.D.a.2.c)

Under the source category "Other organic fertilisers applied to soils" Austria reports ammonia emissions from the following sub-sources:

- N from anaerobically digested energy crops
- Compost application

Both sub-sources are considered to be new sources according to the NEC Directive Annex IV Part 4.

4.2.1 N from anaerobically digested energy crops

This sub-source includes N inputs from energy crops that are digested in biogas plants and applied to soils as fertilisers after the digestion process. These inputs are considered in addition to the N applied to soils resulting from the digestion of animal manure which is included in the source category "Animal manure applied to soils (3.D.a.2.a)".

Evidence that the new emission source category is acknowledged in scientific literature and/or the EMEP/ EEA Guidebook

The source category "Other organic fertilisers applied to soils (including compost)" was introduced to the emission reporting template "NFR14" as a new source for 2015 submissions (-> new NFR source category 3.D.a.2.c). The first EMEP/EEA air pollutant emission inventory guidebook providing specific Tier 1 NH_3 emission factors for other organic wastes is the version of 2016. Following the EMEP/EEA guidebook 2016, digestates produced as a result of anaerobic digestion of organic wastes may contribute to the amount of N applied in "Other organic wastes (3.D.a.2.c)".

Evidence that this source category was not included in the relevant historic national emission inventory at the time when the emission reduction commitment was set

This source of ammonia was not included in the EMEP/CORINAIR atmospheric emission inventory guidebook, second edition 1999 and third edition 2001. This source was not included in Austria's national emission inventory at the time when the emission reduction commitment was set.

N inputs from digestates produced as a result of anaerobic digestion of energy crops were not included in the considerations when establishing the emission ceiling; nor were they included in the RAINS model.

Austria reported NH_3 emissions from energy crops applied to soils as fertilisers after the digestion process (digestate) for the first time in its NEC submission of 31st December 2014.

Evidence that emissions from a new source category contribute to a Member State being unable to meet its emission reduction commitments, supported by a detailed description of the methodology, data and emission factors used to arrive at that conclusion

Austria considered NH_3 emissions from N inputs from digestates produced as a result of the anaerobic digestion of energy crops for the first time in its NEC submission of 31st December 2014 (time series 1990-2013). Due to a lack of specific EMEP/EEA default Tier 1 EFs Austria used a conservative approach by applying the CORINAIR emission factor of urea (0.15 kg NH_3-N/ kg fertiliser N, source: EEA 2007, Table 5.1). In its 2017 submission Austria revised its calculations by using the new EMEP/EEA default Tier 1 NH_3 EF for Other organic wastes according to the EMEP/EEA emission inventory guidebook 2016 (0.08 kg NH_3/kg N). The revision resulted in an annual decrease by about 0.7 kt NH_3 from 2010 to 2014 for digestate application (see IIR 2017, recalculation chapter of the sector "agricultural soils").

Table 6: NH_3 emissions [kt] from N from digested energy crop application, sub. 2017.

	2010	2011	2012	2013	2014	2015
Digestates	0.57	0.54	0.54	0.55	0.54	0.54
3.D.a.2.c (total)	0.67	0.65	0.67	0.66	0.66	0.66
AT Total NH_3	**66.53**	**66.05**	**66.15**	**66.07**	**66.52**	**66.80**

Austria's national NH_3 emissions show a slight exceedance of the emission limit set out in the NEC Directive for 2010 onwards (66 kt). Proposed adjustments for Austria's inventory submission 2017 regarding the new source "Other organic fertilisers/digestates" would reduce ammonia emissions annually by about 0.5 to 0.6 kt NH_3 (see Table 6). Consequently, ammonia emission reduction commitments would be met in 2010, 2011, 2012, 2013 and 2014. With the proposed adjustment compliance in the remaining year 2015 will be achieved if the other proposed adjustments are taken into account (application of sewage sludge and compost).

4.2.2 Compost application

Compost application is the second sub-source contributing to the N amounts considered for ammonia calculations under the source category "Other organic fertilisers applied to soils (3.D.a.2.c)".

Evidence that the new emission source category is acknowledged in scientific literature and/or the EMEP/ EEA Guidebook

The source category "Other organic fertilisers applied to soils (including compost)" was introduced to the emission reporting template "NFR14" as a new source for 2015 submissions (-> new NFR source category 3.D.a.2.c). The first EMEP/EEA air pollutant emission inventory guidebook providing specific Tier 1 NH_3 emission factors for other organic wastes is the version of 2016.

Evidence that this source category was not included in the relevant historic national emission inventory at the time when the emission reduction commitment was set

This source of ammonia was not included in the EMEP/CORINAIR atmospheric emission inventory guidebook, second edition 1999 and third edition 2001. This source was not included in Austria's national emission inventory at the time when the emission reduction commitment was set.

N inputs from compost application on agricultural soils were not included in the considerations when establishing the emission ceiling, nor were they included in the RAINS model.

Austria reported NH_3 emissions from compost applied to soils for the first time in its NEC submission of 15th February 2017.

Evidence that emissions from a new source category contribute to a Member State being unable to meet its emission reduction commitments, supported by a detailed description of the methodology, data and emission factors used to arrive at that conclusion

Austria considered NH_3 emissions from N inputs from compost application for the first time in its recent NEC submission of 15th February 2017 (time series 1990-2015). For the calculations Austria used the new EMEP/EEA default Tier 1 NH_3 EF for Other organic wastes according to the EMEP/EEA emission inventory guidebook 2016 (0.08 kg NH_3/ kg N). The revision resulted in additional ammonia emissions by 0.10 to 0.12 kt NH_3 from 2010 to 2015 (see Table 7 and recalculation chapter in the sector "agricultural soils" of the IIR 2017).

	2010	2011	2012	2013	2014	2015
Compost	0.10	0.11	0.12	0.12	0.12	0.12
3.D.a.2.c (total)	0.67	0.65	0.67	0.66	0.66	0.66
AT Total NH_3	**66.53**	**66.05**	**66.15**	**66.07**	**66.52**	**66.80**

Table 7: NH_3 emissions [kt] from N from compost application, sub. 2017.

Austria's national NH_3 emissions show a slight exceedance of the emission limit specified in the NEC Directive for 2010 onwards (66 kt). Proposed adjustments for the inventory submission 2017 regarding the new source "organic fertilisers/compost" would reduce ammonia emissions annually by about 0.10 to 0.12 kt NH_3 (see Table 7). Consequently, ammonia emission reduction commitments would be met in 2011 and 2013.

With the proposed adjustment compliance will be achieved in the remaining years 2010, 2012, 2014 and 2015 if the other proposed adjustments are taken into account (application of sewage sludge and digestates).

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Austria informed the Commission on 15 February 2017 that it proposed an adjustment to its national emission inventory in accordance with Article 5(1) for NO_x emissions from the transport sector and NH_3 emissions from the agriculture sector.

This report is an addendum to "Austria's Informative Inventory Report 2017" and includes supportive information pursuant to the NEC Directive (EU) 2016/2284 Annex IV Part 4.

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