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Subject:	Proposal for a Directive of the European Parliament and of the Council on the reduction of national emissions of certain atmospheric pollutants and amending Directive 2003/35/EC - Methodological and technical information by the NL delegation regarding the revised Annex II

Following the COREPER 1 meeting on 29 June 2016, delegations will find in Annex the methodological and technical information underpinning the Netherlands Presidency proposal for the revised Annex II of the abovementioned proposal.

Methodological and technical information underpinning

the Presidency proposal for a revised Annex II as set out in document 10607/16 ENV.

Contents

1. Introduction

This document presents the technical and methodological information on which the NL Presidency, after discussions in the Working Party on the Environment and after consultations with delegations, has developed its proposal for a revised Annex II of the NEC Directive as set out in document 10607/16 ENV in view of the COREPER I meeting of 29 June 2016. This document was prepared by the NL Presidency in consultation with the European Commission to ensure consistency with the methodology used to construct the Commission's proposal for a health impact reduction of 52.2% (see Commission impact assessment[1] and update under the TSAP 16 report[2]). It is important to recall that the Commission's proposal sets targets that have been informed by quantitative modelling of baseline emissions and associated impacts, the scope for further emission reduction options, and cost-effective emission reduction strategies[3].

1.1. The Council General Approach

The emissions reduction commitments presented in the Commission proposal were estimated to achieve a 52% reduction of negative health impacts between 2005 and 2030 (measured as reduction of premature deaths caused by air pollution). The 2030 targets as set out in the General Approach of 16 December 2015 decreased that reduction potential to 48%. This 4% drop corresponds to about 8% more premature deaths per year compared to the Commission's proposal.

Table 1 compares the Commission proposal (as adjusted by TSAP 16) with the General Approach in terms of PM equivalent reductions.

The PM equivalence (PMeq) approach is a proxy for the combined effect of pollutants contributing to fine particles and associated health impacts (premature mortality). For the purpose of calculating emissions in PMeq, IIASA elaborated exchange rates between the precursor emissions of PM2.5 (primary PM2.5, SO2, NOx, NH3 and VOC) that lead to equal improvements in premature mortality from fine particulate matter (see IIASA TSAP15 report). The exchange rates established for converting PM precursor emissions into 'PM equivalent emission quantities' are 1.000 for PM2.5, 0.298 for SO2, 0.194 for NH3, 0.067 for NOX and 0.009 for VOC.

On the basis of these exchange rates the reported national base year (2005) emissions for the 5 pollutants concerned can be converted to a PMeq total, as can the 2030 emissions (obtained by applying the 2030 reduction commitments to those base year emissions). Taking the ratio of these PMeq totals gives the PMeq reduction.

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[1] http://ec.europa.eu/environment/archives/air/pdf/Impact_assessment_en.pdf

[2] http://ec.europa.eu/environment/air/pdf/review/TSAP_16a.pdf;
http://ec.europa.eu/environment/air/pdf/review/TSAP_16b.pdf
After the start of the deliberations on the Clean Air Policy Package of the Council Working Party on Environment (WPE), between March and July 2014 the Commission's consultant IIASA held bilateral meetings with all Member States to review and update input data in view of new statistical information (historic emissions). TSAP Report #16 presents an updated set of emission reduction commitments that would meet the health and environmental targets proposed by European Commission in the Clean Air Policy Package in a cost-effective way, based on the revised historic emission estimates and the consequently adapted projections

[3] These analyses underlying the Commission's proposal have been carried out by the International Institute for Applied Systems Analysis (IIASA) using the GAINS Integrated Assessment Modelling suite (http://gains.iiasa.ac.at).

Table 1 shows that for the EU as a whole the PMeq reduction drops from -62.6% under the TSAP16 targets to -57.4% under the General Approach targets. This drop corresponds to a proportional relaxation of around 8.4% ((62.6-57.4)/62.6).

Table 1

MS	COMMISSION - TSAP16 (-52,2% ambition) % PMeq reduction	COUNCIL - general approach (-48,3% ambition) % PMeq reduction	Relative loss in PMeq reduction (GA vs COM) %
Austria	-46,7%	-45,5%	-2,6%
Belgium	-50,2%	-49,3%	-1,9%
Bulgaria	-86,5%	-79,3%	-8,3%
Croatia	-65,2%	-60,7%	-6,9%
Cyprus	-84,9%	-80,9%	-4,7%
Czech Republic	-61,5%	-59,1%	-3,9%
Denmark	-52,3%	-41,0%	-21,6%
Estonia	-56,1%	-52,9%	-5,7%
Finland	-34,5%	-34,9%	1,4%
France	-55,6%	-53,0%	-4,6%
Germany	-49,2%	-46,9%	-4,6%
Greece	-81,5%	-70,1%	-14,0%
Hungary	-60,5%	-49,6%	-18,0%
Ireland	-47,5%	-47,2%	-0,6%
Italy	-55,2%	-48,1%	-12,7% *
Latvia	-40,2%	-38,1%	-5,2%
Lithuania	-42,5%	-37,0%	-12,8%
Luxembourg	-59,2%	-56,5%	-4,5%
Malta	-84,5%	-78,4%	-7,3%
Netherlands	-42,5%	-42,4%	-0,3%
Poland	-62,2%	-56,4%	-9,4%
Portugal	-69,1%	-61,6%	-10,8%
Romania	-75,6%	-61,3%	-18,9%
Slovakia	-65,5%	-53,2%	-18,8%
Slovenia	-73,0%	-65,5%	-10,2%
Spain	-72,2%	-69,3%	-4,0%
Sweden	-26,2%	-28,4%	8,3%
United Kingdom	-69,2%	-64,6%	-6,6%
EU-28	**-62,6%**	**-57,4%**	**-8,4%**

* IT revised its estimate of biomass use in EUROSTAT for historical time series after the TSAP16 targets were set. This had significant impact on the reduction potential for PM2,5. The relaxation of -12,7% drops to -3,3% when disregarding the adjustment of the TSAP16 PM2,5 target resulting from the updated biomass use statistics

Losses in PMeq reductions resulting from the targets as set out in the General Approach have several ramifications in terms of health impacts:

- In certain Member States there would be around 20% more premature deaths annually as a result of the relaxations. In some cases this would be a consequence of a weakening in the Member State's own national targets, but in others cases half the increase in premature deaths would be due to a relaxation of other Member States' targets. In one Member State, in particular, most of the increase in premature deaths compared to the Commission proposal would be a consequence of weaker targets for neighbouring Member States.
- In several Member States, more precursors would arise from trans-boundary effects than from national sources.

In view of the above, it can be concluded that the General Approach deviated from the cost-effectiveness approach of the original Commission proposal without fully factoring in fairness and trans-boundary impacts, thus resulting in a unfair distribution of efforts amongst Member States (in terms of deviation from the proposed Commission's reduction commitments).

1.2. Amended set of targets proposed in 10607/16 ENV

The set of targets proposed by PCY in document 10607/16 is meant to move to an ambition level in health impact reduction of 49.6%, in order to recover some of the losses in cost-effectiveness and fairness of efforts while providing the basis for a compromise with the European Parliament.

Figure below shows the new proposed targets in comparison with the Commission's targets and the general approach targets adopted on 16 December 2015.

MS	COMMISSION - TSAP16 2030 % targets (-52.2% ambition)					COUNCIL - GA 16-12-2015 2030 % targets (-48.3% ambition)					COUNCIL - COREPER I 29-06-2016 2030 % targets (-49.6% ambition)				
	SO2	NOX	PM2,5	VOC	NH3	SO2	NOX	PM2,5	VOC	NH3	SO2	NOX	PM2,5	VOC	NH3
Austria	-41%	-71%	-49%	-40%	-18%	-41%	-71%	-46%	-36%	-18%	-41%	-69%	-46%	-36%	-12%
Belgium	-66%	-59%	-41%	-35%	-13%	-66%	-59%	-38%	-35%	-13%	-66%	-59%	-39%	-35%	-13%
Bulgaria	-93%	-63%	-66%	-69%	-18%	-88%	-58%	-41%	-42%	-9%	-88%	-58%	-41%	-42%	-12%
Croatia	-86%	-62%	-62%	-50%	-23%	-82%	-57%	-55%	-48%	-23%	-83%	-57%	-55%	-48%	-25%
Cyprus	-95%	-70%	-78%	-50%	-21%	-93%	-55%	-70%	-50%	-20%	-93%	-55%	-70%	-50%	-20%
Cz Republic	-73%	-64%	-50%	-50%	-38%	-66%	-64%	-60%	-50%	-22%	-66%	-64%	-60%	-50%	-22%
Denmark	-62%	-66%	-56%	-49%	-32%	-52%	-58%	-41%	-37%	-24%	-59%	-68%	-55%	-37%	-24%
Estonia	-72%	-46%	-41%	-28%	-1%	-68%	-30%	-41%	-28%	-1%	-68%	-30%	-41%	-28%	-1%
Finland	-34%	-47%	-34%	-48%	-15%	-34%	-47%	-34%	-48%	-20%	-34%	-47%	-34%	-48%	-20%
France	-77%	-69%	-56%	-52%	-23%	-75%	-69%	-56%	-52%	-13%	-77%	-69%	-57%	-52%	-13%
Germany	-57%	-64%	-42%	-35%	-38%	-58%	-64%	-42%	-24%	-29%	-58%	-65%	-43%	-28%	-29%
Greece	-92%	-69%	-71%	-64%	-31%	-88%	-50%	-45%	-62%	-10%	-88%	-55%	-50%	-62%	-10%
Hungary	-73%	-66%	-64%	-58%	-43%	-73%	-66%	-48%	-58%	-25%	-73%	-66%	-55% *	-58%	-32% *
Ireland	-82%	-71%	-39%	-32%	-10%	-85%	-69%	-41%	-32%	-5%	-85%	-69%	-41%	-32%	-5%
Italy	-71%	-68%	-54%	-49%	-22%	-71%	-65%	-40%	-46%	-14%	-71%	-65%	-40%	-46%	-16%
Latvia	-42%	-41%	-46%	-42%	+3%	-46%	-34%	-43%	-38%	-1%	-46%	-34%	-43%	-38%	-1%
Lithuania	-65%	-51%	-48%	-47%	-2%	-60%	-51%	-35%	-47%	-10%	-60%	-51%	-36%	-47%	-10%
Luxembourg	-45%	-85%	-43%	-49%	-24%	-45%	-82%	-40%	-41%	-22%	-50%	-83%	-40%	-42%	-22%
Malta	-95%	-79%	-76%	-27%	-24%	-95%	-79%	-50%	-27%	-24%	-95%	-79%	-50%	-27%	-24%
Netherlands	-58%	-61%	-40%	-22%	-21%	-58%	-61%	-40%	-15%	-21%	-53%	-61%	-45%	-15%	-21%
Poland	-77%	-51%	-46%	-55%	-22%	-69%	-39%	-46%	-26%	-22%	-70% *	-39%	-58% *	-26%	-17%
Portugal	-83%	-61%	-68%	-44%	-19%	-83%	-61%	-51%	-38%	-14%	-83%	-63%	-53%	-38%	-15%
Romania	-92%	-62%	-69%	-67%	-28%	-85%	-57%	-39%	-43%	-22%	-88%	-60%	-58%	-45%	-25%
Slovakia	-82%	-48%	-63%	-32%	-43%	-82%	-48%	-40%	-32%	-30%	-82%	-50%	-49%	-32%	-30%
Slovenia	-88%	-65%	-76%	-59%	-26%	-91%	-65%	-58%	-53%	-15%	-92%	-65%	-60%	-53%	-15%
Spain	-87%	-66%	-62%	-39%	-21%	-87%	-62%	-50%	-39%	-16%	-88%	-62%	-50%	-39%	-16%
Sweden	-14%	-66%	-17%	-39%	-17%	-22%	-66%	-19%	-36%	-17%	-22%	-66%	-19%	-36%	-17%
UK	-89%	-74%	-53%	-39%	-24%	-87%	-72%	-45%	-39%	-11%	-88%	-73%	-46%	-39%	-16%
EU-28	**-81%**	**-65%**	**-54%**	**-45%**	**-25%**	**-78%**	**-62%**	**-45%**	**-40%**	**-18%**	**-79%**	**-63%**	**-49%**	**-40%**	**-19%**

* Adjusted after COREPER I meeting of 29 June 2016 by figures that can achieve the same health impact reduction:
HU: weaker PM2,5 target of -55% (instead of -58%) is compensated by tighter NH3 target of -32% (instead of -27%)
PL: weaker SO2 target of -70% (instead of -72%) is compensated by tighter PM2,5 target of -58% (instead of -54%)

The new targets take account of the General Approach figures and the latest data and information that has been made available since the previous round of analysis was finalised. Rather than relying on modelled re-optimisation, they were developed according to the following methodology:

a) The latest reported data (emissions, activity data) by Member State for the base year 2005 and latest historic years 2013 and 2014 (submission 2016) were used for the analysis, as well latest projections that were reported or made available. Emissions from the Canary Islands, the French overseas departments, Madeira and the Azores were excluded as per Article 2 paragraph 2 of the consolidated text of the draft Directive. Furthermore, VOC and NOx emissions from (NFR)(2014) categories 3B (manure management) and 3D (agricultural soils) were excluded as per the Article 4 paragraph 3 point (da). Emissions based on fuel sold were used consistent with the methodology that was used to construct the Commission's proposed targets.

b) The key remaining differences between national assumptions (including those used for latest reported projections or more recent updates) and those in the TSAP 16 analysis were identified (Some differences had already been addressed as TSAP 16 incorporated revised assumptions following IIASA's technical meetings held with Member States in 2014.)

c) Sensitivity analysis was conducted to check the impact of the remaining differences on the reduction potential. Examples of the most significant differences included: different projections for animal numbers in 2030; different projections on the turnover rate of domestic combustion installations and vehicle and non-road mobile machinery stock; different views on the composition of the energy mix in 2030 (different consumption levels, different distributions); and different account (effectiveness, timing) of current legislation in national projections (in particular with respect to recently adopted legislation like eco-design requirements on domestic appliances, Directive on Medium Combustions Plants, new BAT conclusions under the Industrial Emissions Directive and the revised Directive on Non-Road Mobile Machineries).

One particular issue that emerged for several countries and that explain some of the divergences with national projections was the exclusion of emissions from field-burning of agricultural wastes in the emission inventories and related differences in expectations concerning the enforcement of the (already existing) ban of this activity. In developing the targets, due account was made for incidental firing and enforcement issues.

The main discrepancies related to projected activity in 2030, rather than to current or historic emissions.[4] While the relevant EU projections for 2030 had undergone substantial review and consultation in the context of PRIMES and CAPRI, and were also the basis for the analysis underlying the EU's Climate and Energy Package, projections are inevitably uncertain, and sensitivity analysis was used to identify the most important issues.

The likelihood of a given projection materialising fully in practice was also borne in mind. For instance, the probability that very large rises in animal numbers will be realised in the context of the current and projected global agricultural market conditions is open to question, and so in some cases intermediate positions were considered.

Also, assumptions are in part a matter of policy priorities. The replacement rate for domestic combustion installations depends in large part on national policy, and Member States in very

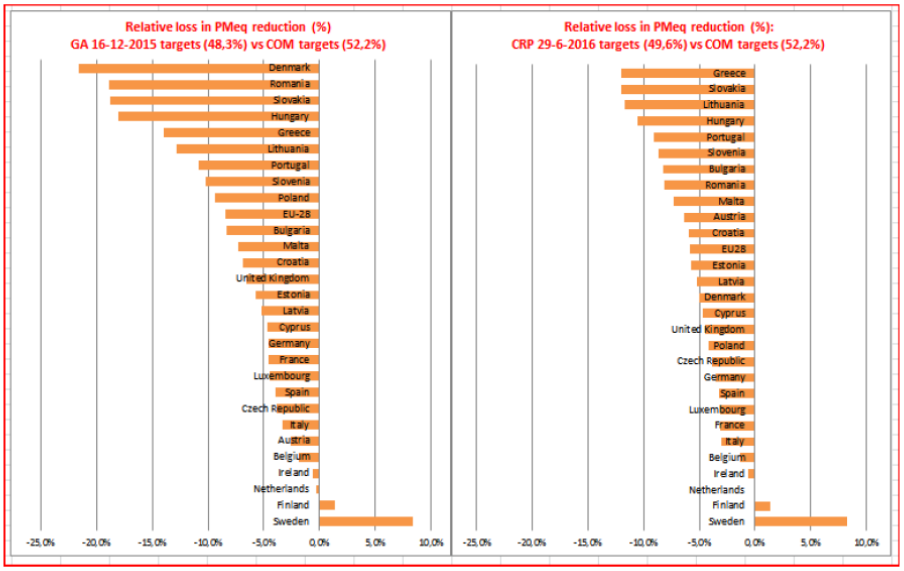
[4] An exception is IT, which in 2015 (after the TSAP 14 and 16 documents had been finalised) revised its estimate of biomass use in EUROSTAT for historical time series.

similar conditions had made very different assumptions, reflecting, not technical constraints, but political will.

A final consideration specific to the domestic combustion sector is its impact on the widespread non-compliance with the PM10 limit values of the Ambient Air Quality Directive. For this reason, very conservative projections of domestic reduction potential were treated with some caution, so as not to undermine broader compliance with air quality legislation.

On the above technical basis, analysis was conducted for each Member State to identify where an adjustment in reduction potential and resulting target per pollutant could be justified so as to 'hedge' for the different assumptions on future developments, while adhering to the overall approach of comparable efforts between Member States. The analysis per Member State presented in section 2 of this document explains in detail how the Member States' concerns on underlying assumptions have been addressed in the context of the new targets proposed.

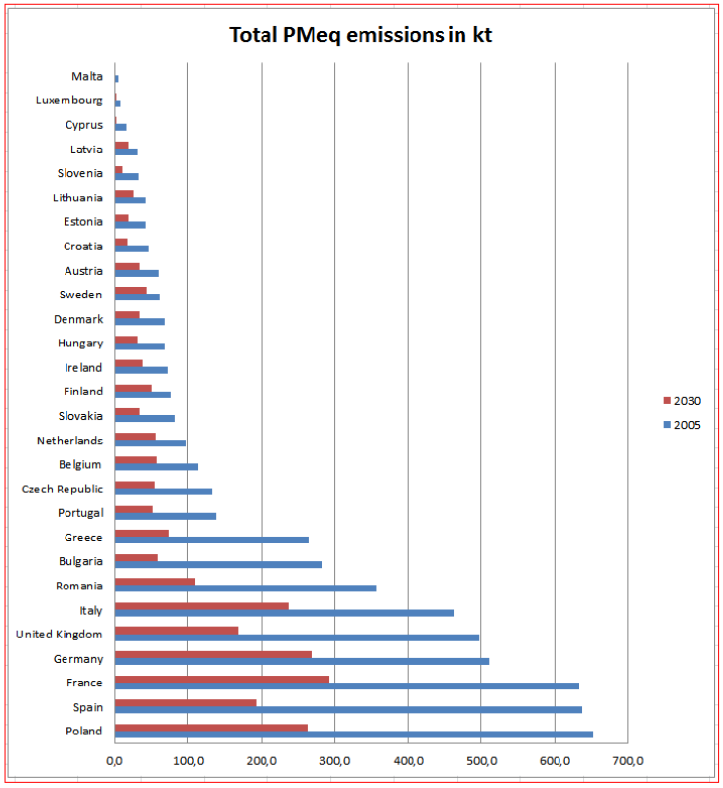
As an overall framework for the sensitivity analysis, and a check on the implications for the health impact reduction, the PM equivalent reduction deviation from the TSAP 16 figures which resulted from any adjustments was tracked. The case-by-case analysis for each Member State showed that the reasonable concerns of Member States could be accommodated within a narrower bandwidth of deviation from the TSAP 16 reductions than achieved with the general approach targets adopted on 16 December 2015. The relaxations of % PMeq reductions compared to the % PMeq reductions achieved on the basis of the TSAP 16 figures are indicated in figure below.



The left side of figure above illustrates the deviation from the Commission's proposed targets embedded in the 48.3% Annex II as set out in the General Approach (in PM equivalent terms or a proxy for the combined effect of all pollutants contributing to fine particles and associated health

impacts). The deviations are indicated on the X-axis (in relative relaxations of PMeq reductions). It can be compared with the right hand side of the figure which showsthe 49.6 % Annex II circulated for the COREPER I meeting of 29 June 2016, whereby the maximum deviation from the cost-effectiveness level was reduced from about -22% to -12%.

It is reasonable to expect, on fairness grounds, that comparable Member States (in terms of size, emissions, bearing on the overall health target, socio-economic conditions) make comparable efforts This means inter alia that the largest emitters must take up their fair share of the responsibility for the health impacts they generate for countries and people downwind. Figure below ranks the MS in terms of total emission in PMeq (for 2005 and 2030), showing inter alia which MS are the largest EU emitters: the six largest emitters are the six biggest MS.



In developing the new reduction targets for 2030 starting from the General Approach additional pledges received from MS were taken into account to the extent that the final proposed targets for the MS concerned achieve the same health impact reduction as initially proposed for these MS (see section 2 for detailed explanations).

1.3 EU overview

Table below provides an overview of where the EU currently stands vis-à-vis the provisionally agreed NEC emission reduction commitments. The latest reported emissions and projections by MS were used to calculate the emission reductions achieved on average for the EU 28 for the years 2013 and 2014 and what will be achieved according to latest reported national projections for the target year 2030.

EU 28	Reported data MS			NEC targets			
% reduction compared to 2005	Emissions 2013	Emissions 2014	Projections 2030	2020	2030 GA (16-12-2015)	2030 COREPER I (29-06-2016)	2030 COM
	submissions MS 2015	submissions MS 2016	submissions MS 2015-2016		(-48.3%)	(-49.6%)	(-52.2%)
SO2	-55%	-60%	-70%	-59%	-78%	-79%	-81%
NOX	-31%	-35%	-56%	-42%	-62%	-63%	-65%
PM2,5	-12%	-18%	-25%	-22%	-45%	-49%	-54%
NMVOC	-25%	-29%	-35%	-28%	-40%	-40%	-45%
NH3	-5%	-3%	-5%	-6%	-18%	-19%	-25%

The left side of the table testifies to the somewhat conservative nature of national projections. For SO2 and VOC the 2020 targets are already achieved in 2014; for other pollutants the remaining distance to the 2020 targets is small.

To reach the 2030 targets proposed in document 10607/16 ENV, the most extra efforts (proportionally) will be required for PM2.5 and NH3.

2. Analysis per MS

This chapter sets out the information base per member state and pollutant for the proposal for an Annex II of the NEC Directive that would achieve a reduction in health impacts in the EU of 49.6%, as circulated in document 10607/16 ENV. It provides the technical analysis and justification of the proposed targets vis-à-vis the Commission's proposed targets achieving a 52.2% reduction in health impacts and the General Approach targets achieving a 48.3% reduction in health impacts. It identifies to what level the targets that were weakened and deviated from cost-effectiveness under the general approach should be tightened again to increase the ambition level back from -48.3% to -49.6%, whilst restoring the lack of comparable efforts across MS that resulted from the general approach.

It can be noted that part of the significant loss in the EU average reductions of NH3 and PM2.5 emissions induced by the general approach targets is restored with the proposed new set of targets (see table in section 1.3).

2.1. Austria

The analysis below provides the technical explanation for AT on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030	2030	**2030**
							COM/EP	Council	**New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2014)				Reduction commitments new NECD			
	kt		% reduction compared to 2005 national emission total						
SO_2	27.4	26.4	-40	-39	-28	-26	-41	-41	**-41**
NO_X (*)	229.7	228.8	-32	-37	-53	-37	-71	-71	**-69**
$PM_{2.5}$	21.7	22.1	-18	-25	-28	-20	-49	-46	**-46**
VOC (*)	170.1	134.8	-16	-19	-27	-21	-40	-36	**-36**
NH_3	61.8	66.0	+1	+1	+1	-1	-18	-18	**-12**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

In view of the limited feedback by AT on the annex II 2030 targets prior to the Council of the 16th of December 2015, the values as in 14645/15 were retained for AT in the general approach. AT disagreed with these values and communicated less strict targets for 3 of the 5 pollutants after the 16th. (-40% for SO_2, -63% for NO_X, -38% for VOC, -6% for NH_3 and -46% for $PM_{2.5}$). The proposed targets by AT would lead to considerable loss in the health impact reduction ambition compared to the TSAP 16 targets, mainly induced by the proposed weaker targets for NO_X and NH_3. The analysis below shows that on technical grounds this loss can substantially be reduced.

It is worth noting that the COM (TSAP16) SO_2 target of -41% is already almost achieved (reported emissions for 2013 and 2014 show a reduction of around -40%).

B. Analysis of proposed 2030 targets

1. SO_2

Proposed TSAP16 target of -41% should be achievable considering that the achieved reduction in 2013 and 2014 compared to 2005 is already around -40%, This 40 % reduction is mainly accomplished by a switch from solid and liquid fuels to gas and biomass in the electricity sector, measures in Austria's refinery and reduced use of S-containing fuels (liquids, solids) for residential and commercial combustion. These measures correspond in broad lines with the GAINS analysis. To achieve the proposed target of -41% only 0,25 kt extra needs to be further reduced compared to the -40% reduction target that AT offered. This could be delivered by inter alia further reduced use of (S-containing) liquid or solid fuels or additional controls in the energy sector, industry or households. According to GAINS there would for example be sufficient reduction potential left in industry. Further implementation of IED (LCP-ELV and BATAELs) and MCPD (ELV) may also help in delivering the additional necessary emission reduction in the energy sector and/or industry.

Note that Austria's counteroffer of -40% for SO2 is based on updated projections that were developed in 2015 (UBA, 2015, REP-0556). Since then reported emissions (time series) have been updated: latest reported emission total for the year 2013 (submission 2016) now shows a reduction compared to the latest reported emission total for 2005 (submission 2016) of -40%, where this was -35% according to reported emission estimates in 2015 (at the time when projections were developed). This may have a positive impact on the projected reduction potential that Austria developed in 2015 (-39%), in particular considering the downwards revision of historic emissions for the energy sector and iron and steel (emission estimates for these sectors decreased for the year 2013, while not for the base year 2005).

2. NO_X

According to GAINS, 82% of the required reduction will be delivered in road transport, mainly as the result of the turn-over to Euro 6 vehicles (93% euro 6 share for cars, 84% euro 6 share for diesel LDV and 98% euro 6 share for diesel HDT) and some activity changes (gasoline use in cars drops with 60%). The proposed target of -71% (based on fuel sold emissions) is largely dependent on the assumptions that GAINS uses for cars, LDV and HDV (diesel/gasoline shares, turnover rates, performance of euro 6, activity levels). Latest Austria's national air emission projections for 2030 (UBA, 2015, REP-0556) show that NOX could be reduced compared to 2005 by -63% on the basis of existing measures and by -67% on the basis of additional measures (fuel sold basis). These projections still include the NOX emissions from agriculture. When excluding these emissions (as proposed in the consolidated text of the new NECD), Austria's projected reductions of -63% and-67% would respectively change to-64% and -69%.

According to the GAINS analysis the TSAP16 target of -71% can be achieved by current legislation (CLE) only and wouldn't require additional control. In addition to the CLE reductions in road transport, GAINS also assumes that about 10% of the required reduction will be delivered in the NRMM sector through the renewal of the agricultural and industrial mobile machinery to stage IIIb and IV (complying with the requirements of the NRMMD). Agricultural machinery is renewed to 76% stage IV in 2030 (88% abatement vs no control). Industrial mobile machinery is renewed to 96% stage IV in 2030 (76% abatement vs no control). Diesel use in the agricultural machinery goes down with about 40%. The remaining part of the required reduction will - according to GAINS - mainly be delivered by activity changes in the PP sector and domestic combustion. A margin of 2% (reducing the target from -71% to -69%) can be allowed to account for discrepancies in the underlying assumptions between GAINS and national views (in particular in relation to the amount of fuel sold, that strongly depends on fuel price policy and price differences with neighbouring countries).

3. $PM_{2.5}$

As for NOX, GAINS assumes most reduction will be delivered from road transport (39%); followed by domestic combustion (28%) and non-road (18%). Less optimistic national assumptions on domestic wood combustion (less turn over, more biomass use) would reduce Austria's overall potential with a few percentage points. A target of -46% is deemed realistic and achievable.

4. VOC

Key sectors that will deliver the required reductions according to GAINS are domestic combustion (renewal/reduction in domestic wood boilers and stoves), road transport (fleet renewal, reduction in gasoline cars) and solvent use. Less optimistic assumptions on domestic wood combustion (less turn over) could reduce potential with a few % points. Latest Austria's national air emission projections for 2030 (UBA, 2015, REP-0556) show a reduction potential for VOC of -39% (WaM, fuel sold basis). When excluding emissions from agriculture the -37% converts to -38%.

Note that the VOC emission inventory in the 2016 submission was significantly revised downwards, mainly for VOC emissions from solvent use activities (domestic solvent use, coating applications ...): the impact of this revision on the overall reduction potential is uncertain, but it can be noted that the revised reported emissions for the year 2013 in submission 2016 show a reduction compared to 2005 that is several reduction % points less than according to reported estimates for that same year in submission 2015. Retaining the general approach target of -36% instead of last year's projected reduction potential of -38% is therefore deemed realistic and achievable.

5. NH_3

Most measures that GAINS identified as cost-effective on manure management are the cheaper measures (feeding measures, improved manure land spreading and manure coverage) for pig farms (on liquid systems), poultry farms and meat cattle farms. Total cost of the additional measures for the cattle, pigs and poultry farms is estimated at 7.4 M EUR (or around 435 EUR/ton NH3 reduced; EU average is 560 EUR/ton). GAINS is not more ambitious for AT with respect to the identified reduction potentials for cattle and swine (key categories) than the EU average potentials. AT has concerns regarding the applicability of certain measures and disagrees with the GAINS assumptions. It argues that the structure of the farms (more than 40% of livestock farms are farms with less than 10 livestock units[5]) and the topography constrain the implementation of in particular the improved manure land spreading techniques. According to GAINS around 40% of the NH3 emissions from livestock farms come from farms with more than 50 livestock units.

Contrary to the reported livestock projections in 2014 (LRTAP), the updated projections developed in 2015 assume now animal numbers of dairy cattle and swine to increase by 2030, while poultry production is expected to decrease. GAINS assumes the number of dairy cattle to increase with 5%, while assuming decreases of respectively 0.5%, 5% and 6% for meat cattle, pigs and poultry. A margin of 3% reduction points (reducing the NH3 target from -18% to -15%) should accommodate for an increase of 15% in the number of dairy cattle and pigs between now (2014) and 2030 (or on average 1% increase per year). AT expects an increase in pigs of +13%. A further margin of 3% reduction points should be sufficient to account for Austria's concerns on the applicability of certain measures (in particular to account for restrictions on the use of low ammonia spreading techniques). This brings the NH3 target to -12%.

[5] It should be noted that the Directive includes a specific provision that should prevent impacts on small farms (Annex III, part 2, section C)

2.2. Belgium

The analysis below provides the technical explanation for BE on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP -52.2%	2030 Council -48.3%	**2030 New -49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2015)				Reduction commitments new NECD			
	kt		% reduction compared to 2005 national emission total						
SO_2	140.3	142.6	-69	-70	-70	-43	-66	-66	**-66**
NO_X (*)	303.4	304.5	-36	-39	-61	-41	-59	-59	**-59**
$PM_{2.5}$	37.1	36.5	-6	-23	-33	-20	-41	-38	**-39**
VOC (*)	151.3	147.7	-32	-37	-34	-21	-35	-35	**-35**
NH_3	71.7	68.4	-2	-3	-10	-2	-13	-13	**-13**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

It can be noted that emission reductions achieved in 2014 according to the latest reported emissions (LRTAP submission 2016) are already steeper than the proposed TSAP16 targets for SO_2 and VOC.

B. Analysis of proposed 2030 targets

1. SO_2

Proposed cost-optimized TSAP16 target of -66% was retained for the general approach. The target is already achieved according to latest emissions reported for 2013-2014.

2. NO_X

Proposed cost-optimized TSAP16 target of -59% was retained for the general approach.

3. $PM_{2.5}$

BE expressed concerns on the achievability of the proposed TSAP16 target and therefore proposed flexibility to account for cold winters (that can result in increased PM2.5 emissions from extra biomass burning ...). A weakening of the PM2,5 target of -2 to -3% points (≈1 kt PM2,5) was considered sufficient margin to account for cold winters or other uncertainties.

4. VOC

Proposed cost-optimized TSAP16 target of -35% was retained for the general approach. The target is already achieved according to latest emissions reported for 2014.

5. NH_3

Proposed cost-optimized TSAP16 target of -13% was retained for the general approach.

2.3. Bulgaria

The analysis below provides the technical explanation for BG on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP	2030 Council	**2030 New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2016)				Reduction commitments new NECD			
	kt	% reduction compared to reported 2005 national emission total							
SO_2	761.7	778.6	-75	-76	-88	-78	-93	-88	**-88**
NOX (*)	161.2	185.0	-31	-28	-58	-41	-63	-58	**-58**
$PM_{2.5}$	38.9	28.5	+4	0	-41	-20	-66	-41	**-41**
VOC (*)	128.2	85.8	-7	-8	-42	-21	-69	-42	**-42**
NH_3	39.0	47.6	--35	-35	-9	-3	-18	-9	**-12**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

In comparison with the TSAP 16 targets for SO_2 and NH_3 of respectively -93% and -18% it is worth noting that reported emissions for the last two years (2013-2014) show a reduction of respectively around -76% and -35%, i.e. good progress towards (or overshooting of) the 2030 targets.

B. Analysis of proposed 2030 targets

1. SO_2

The public electricity sector is the key sector that contributes to the SO2 emissions in BG, in particular because of the use of lignite. According to GAINS around 90% of the required reduction will be delivered by activity changes and controls in the public power plants (lignite, coal).

The discrepancy between the GAINS analysis and the national analysis with respect to achievability of the SO2 TSAP-16 target of -93% mainly relates to different assumptions on the lignite firing in power plants, in particular with respect to the S- content and calorific value of the lignite used, the total lignite consumption assumed by 2030 and the desulphurisation rate of the SO2 abatement systems (FGD). Fully applying the national views on lignite firing would lower the overall reduction potential from -93% to -88%.

BG is currently updating the existing FGD systems on its lignite plants to implement the stricter desulphurisation rates defined by the IED (applicable from 1 January 2016) and this will help BG to reach the reduction of -88% according to its national views. The new BAT conclusions for LCP's that are currently being processed for adoption could deliver even deeper cuts on the SO2 emissions from its lignite plants by 2030 than now envisaged. In this context a target of -88% (5% away from the cost-effective target of -93%) should provide sufficient margin to accommodate different assumptions, allowing also at the same time to account for the possible (smaller)

discrepancies/different views on industry (sulphuric acid production, NFM production, refineries) and domestic combustion.

2. NO_X

NOX was only briefly discussed at the bilateral between BG and COM: the key issues that were identified regarding NOX related to the energy sector (see also SO2) and the nitric acid production.

According to the GAINS analysis, 50% of the required reduction will be delivered by road and non-road transport (fleet renewal), 31% by the PP sector and 18% by industry (nitric acid production, refineries ...). The proposed TSAP16 target of -63% can be met almost to its full extent by current legislation (CLE = -62%). The latest projections reported by BG (February 2016) also show a reduction of -58% compared to the 2005 level (submission 2014) (-62% if compared to 2005 level as reported in 2015/2016).

BG assumes 30% more use of lignite in PP than GAINS in 2030. This could lead to 1 or 2 percentage points loss in reduction potential. BG took a considerable additional margin here with its counteroffer of -58% for the General Approach, by using higher abated EF for lignite and coal firing in its PP (the revised abated EF for coal does not even meet the minimum applicable IED-ELV).

BG promised to check whether the reduction potential for nitric production was already booked, but no additional information on this issue was provided to COM after the bilateral. GAINS assumes that NOX emissions from the nitric acid production in BG will go down by about 10 kt, going to a level of 9 kt NOX/Mt HNO3 produced. This is much lower than current reported implied levels by BG (around 40 kt/Mt), but still higher than some of the average levels achieved already in some other countries (down to 1 or 2 kt/Mt). It appears that quite some reduction potential is left in the nitric acid production in BG. BAT is to reduce NOX to an emission concentration of 160-190 mg/Nm^3 (SCR).

BG should be able to achieve a target of around -60% for NOX. Considering the very small impact of a tightening of the NOX target of -58% to -60% on the health impact reduction, the general approach target of -58% can be retained.

3. $PM_{2.5}$

The key discrepancies with respect to the proposed PM2.5 TSAP16 target relate to domestic combustion and field burning. Discrepancies between GAINS and national views regarding industrial emissions are minor.

Accounting for field burning is crucial: a full 100% ban (as assumed in GAINS) accounts for 14% points reduction in GAINS (19% if applied to BG's reported emissions).

BG's General Approach target for PM2.5 is -41%. BG argued for this target mainly on the basis of different views in the domestic sector and not banking on the reduction potential from banning field burning. BG applied following calculations in support of lowering the TSAP16 target from -66% to -41%:

- BG assumes a higher biomass, lignite and coal bricks consumption in domestic stoves than GAINS in 2030 (biomass = 26.5 PJ instead of 19 PJ; BC = 0.8 PJ instead of 0 PJ; DC = 1.2 PJ instead of 0.1 PJ) and a lower share delivered by renewables (solar ...). BG also assumes a

much lower turnover rate of its domestic stoves than has been identified in GAINS as cost-effective. After consultations with manufacturers and other experts it believes that a distribution of 30% new, 50% improved and 20% no control is more realistic by 2030 than the GAINS distribution of 20% new and 80% improved. BG's national view is closer to the GAINS CLE case. The combination of all these different national assumptions would result in an increase of 4.76 kt, corresponding to a loss in reduction potential of around -12% points.

- BG did not take into account the reduction potential from banning field burning of agricultural wastes (arguing these fires are not intentional) resulting in an extra 5.36 kt, corresponding to a loss in reduction potential of around -14% points.

It is arguable that BG should strive to a 75% ban of field burning of agricultural wastes. This would increase the GA-target already from -41% to -50%. Assuming that not all extra biomass that BG expects to be used in the domestic sector would go to stoves, but partially (a few PJ) also to cleaner devices like automatic boilers, a target of -52% seems reasonable and achievable. The new eco-design standards for new domestic wood stoves and boilers will also provide additional help in further reducing $PM_{2.5}$ emissions from domestic combustion. Nevertheless BG is not willing to accept a PM2.5 target beyond -41%. Given that the overall relaxation of the PMeq reduction of BG's new targets compared to the TSAP16 targets is around 8% (within the bandwidth of 0 to 12%, used as pragmatic approach to get to a 49,6% reduction in health impacts in the EU), the general approach target of -41% can be retained.

4. VOC

The national emission inventory of VOC is incomplete and of insufficient quality. In this context it is difficult to do a sensitivity analysis on the IIASA assumptions but below the best attempt.

BG's General Approach target for VOC is -42%. BG argued for this mainly based on different views in the domestic sector, on not banking on the reduction potential from banning field burning, and on additional discrepancies in the solvent use sector and a correction of GAINS base year emissions from road transport. BG applied the following calculations:

- domestic sector: see PM2.5 analysis for different national assumptions on biomass use and turnover rates. The combination of all these different national views would result in an increase in GAINS of 8.2 kt, corresponding to a loss in reduction potential of around -8% points;
- field burning: BG did not take into account the reduction potential from banning field burning of agricultural wastes (arguing these fires are not intentional) resulting in an extra 7.2 kt, corresponding to a loss in reduction potential of around -7% points;
- road transport: applying the national 2005 emission estimates for road transport (23.0 kt instead of 44.7 kt) reduces the reduction potential in the GAINS analysis with around -7% points;
- solvent use: different national views for fat oil sector (more activity, less reduction potential) results in around 5% points less remaining reduction potential than calculated by GAINS.

It is arguable that BG should strive for a minimum 75% ban of field burning of agricultural wastes (not banking on a full ban of field burning practices, but instead 75%, could account for incidental firing and implementation issues). This would increase the GA-target already from -42% to -47%. Assuming

that not all extra biomass that BG expects to be used in the domestic sector would go to stoves, but partially (a few PJ) also to cleaner devices like automatic boilers, the target can be further adjusted from -47% to -49%. Also it appears that BG in its calculations for the domestic sector applied the 'no control' emission factor for improved single house boilers burning wood. Correcting this would bring the target from -49% to -50%. The remaining discrepancies identified by BG for road and solvent use lead together to a difference in reduction potential of -12%: as these are likely to be rather conservative estimates, a VOC target of -54% would seem reasonable and achievable. Nevertheless, as for PM2.5, BG is not willing to accept a VOC target that is stricter than -42%, the target that BG accepted for the general approach. Given the minimal impact of a further tightening the VOC target on the health impact reduction and given, as explained for PM2.5, that the overall relaxation of the PMeq reduction of BG's new targets compared to the TSAP16 targets is around 8% (within the bandwidth of 0 to 12%, used as pragmatic approach to get to a 50% reduction in health impacts in the EU), the general approach target for also VOC (-42%) can be retained.

5. NH_3

Proposed TSAP16 target of -18% can be achieved at a reasonable low (additional) cost of 360 EUR/t NH3 reduced, mainly banking on the cheaper measures.

Reported NH3 emissions for years 2013 and 2014 reached a reduction of around -35% compared to the reported 2005 level, mainly because of a decrease in livestock (cows, pigs, sheep) between 2005 and now.

The GAINS 2030 projections on animal numbers are higher than current reported levels (2013/2014), and thus BG could increase its farming activities without jeopardizing the achievability of the proposed TSAP16 target.

BG's General Approach target for NH3 was -9%. This target was established on the basis of higher numbers of animals in 2030 and not banking on the reduction potential from banning field burning. BG applied the following calculations:

- it applied the GAINS control strategy to the higher numbers of animals as projected by the Ministry of Agriculture and Food (MAF) resulting in an extra 2.5 kt, corresponding to a loss in reduction potential of -6% points;
- it did not take into account the reduction potential from banning field burning of agricultural wastes resulting in an extra 1.1 kt, corresponding to a loss in reduction potential of -3% points.

It is arguable that BG should at least strive to implement a 75% ban of field burning of agricultural wastes. This would increase the GA-target from -9% to -11%. BG did not include the lower number for poultry and horses it expects in its calculations. If this is taking into account, a target of -12% is deemed realistic and achievable.

2.4. Croatia

The analysis below provides the technical explanation for HR on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2030 WaM	2020	2030 COM/EP	2030 Council	**2030 New**
								-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2016)					Reduction commitments new NECD			
	kt	% reduction compared to 2005 national emission total								
SO_2	65.3	58.1	-72	-73	-83	-86	-55	-86	-82	**-83**
NO_X (*)	80.3	79.2	-34	-33	-62	-67	-31	-62	-57	**-57**
$PM_{2.5}$	14.5	15.6	-30	-24	-58	-62	-18	-62	-55	**-55**
VOC (*)	100.8	76.1	-39	-30	-57	-60	-34	-50	-48	**-48**
NH_3	39.6	34.6	-22	-24	-37	-38	-1	-23	-23	**-25**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

In comparison with the TSAP 16 target for SO_2 of -86% it is worth noting that reported emissions for the last two years (2013-2014) already show a reduction of -72/73%. A similar observation can be made for NH3 (-24% in 2014 compared to the target of -23% by 2030). In addition, the reported WaM achieve or overshoot the TSAP targets proposed for all pollutants.

B. Analysis of proposed 2030 targets

1. SO_2

According to the GAINS analysis around 45% of the required SO2 reduction to reach the TSAP-16 target of -86% would have to be delivered by activity changes (in particular by strong drops in coal and HFO use in power plants) and the remaining part (55%) by controls (CLE and additional) in mainly road transport and industry. The main discrepancies between GAINS and the national projections (national projections discussed with COM in October 2015 would bring emissions down for HR by 70% compared to 2005) relate to the assumptions for power plants and refineries. HR expects more coal generated electricity by 2030, more crude throughput (although already dropped in recent years) and a different fuel mix in its refineries and less reduction potential for its refineries than GAINS assumes. HR has submitted updated projections in February 2016 that now show a much deeper reduction, close to the TSAP target (without measures = -83%; with additional measures = -86%). Projections were revised downwards for mainly the energy sector.

Note that even with firing additional coal in power plants as expected by HR (20 to 30 PJ) the net impact on loss of reduction potential would be small (1 or 2% points) if applying BAT for LCP's (according to the new emerging BAT for LCPs average emission levels of 60 mg/Nm³ to 100 mg/Nm³ should be achievable and realistic for coal fired plants). With respect to the refinery sector, the reduction potential in HR projections (October 2015) was underestimated compared to current levels

already achieved in refineries in other EU MS. The new BAT conclusions adopted for refineries can certainly help HR to substantially further reduce the SO2 emissions from its refineries, also bearing in mind that Croatia's updated projections for the energy sector (power plants, refineries) significantly dropped.

The recent revision of the 2005 SO2 emission inventory (submission 2015) halved the SO2 estimate from road transport: applying this new estimate (based on an average lower S-content of the diesel used in this base year) in the GAINS analysis would result in about 1% point less reduction potential.

In general, the proper implementation of the IED-LCP-ELVS and the new BAT conclusions for LCP and refineries should make a target not far from the TSAP target of -86% acceptable. A target of at least -83% is deemed realistic and achievable. HR seems to confirm this view with its latest reported projections (February 2016).

In this context it can also be noted that the achieved reduction in 2014 compared to 2005 is already -73%.

2. NO_X

According to the GAINS analysis, 64% of the required reduction will be delivered by road and non-road transport (fleet renewal), 20% by industry (refineries and other) and 15% by the PP sector (mainly by reducing use of coal and HFO; switch to gas).

Updated projections that were provided by HR for the bilateral between COM and HR (October 2015) show a reduction potential of -58% (excluding NOX from agriculture). The main discrepancies on reduction potential with GAINS relate to the energy sector and road transport where national projections are on the conservative side. The use of more gas instead of coal and HFO (as assumed by GAINS), for which lower NOX levels can be achieved (+ application of IED and new BATc for LCP) should provide more reductions in energy sector than HR projects. The use of additional coal in the PP sector as HR projects (see also SO2) could result in a loss of reduction potential compared to GAINS of around 1 to 2% points.

HR has also for NOx submitted updated projections in February 2016 that now show a reduction in line with the proposed TSAP target (-62% with existing measures; -67% with additional measures). Projections for the energy sector and road were adjusted downwards.

(Additional notes on projections provided in October 2015 (NOX = -58%): for road, HR assumes a low share of Euro 6 vehicles in 2030 (69% for cars, LDV, HDV): in particular for HDV a Euro 6 share of 69 % in 2030 seems low considering these trucks would be more than 17 years old by then. The difference in the 69% share for Euro 6 HDV by HR and the 96% share assumed by GAINS largely explains the remaining discrepancy of 4% in reduction potential between GAINS and HR. Applying the EU28 average share for cars and HDV (84% - 86%) would reduce the reduction potential by about 1 to 2 % point)

In view of the updated projections for the energy sector and road transport that HR reported (February 2016) and possible remaining discrepancies, a reduction target of at least -59% should be reasonable and achievable (2% points tighter than the general approach target). Nevertheless, instead of agreeing to a tightening of its NOX target with 2 % points (from -57% to -59%), HR

proposed a tighter NH3 target of -25% (2% points above the TSAP16 target of -23%). The swapping between NOX and NH3 results in the same health impact reduction.

3. $PM_{2.5}$

Updated projections that were provided by HR for the bilateral between COM and HR (October 2015) show a reduction potential of -27% (emissions going down from 15,4 to 11,3 kt). Main discrepancies in reduction potential that were noted relate to the power plants, road transport, domestic combustion and field burning. The inclusion of the emissions of field burning to the inventory and a full ban by 2030 would bring the national reduction potential from -27% to -37%. Additional (feasible) reduction on power plants (-0,5 kt), road (-0,5 kt) and domestic (-3 to -4 kt) would increase the overall reduction to ≥-60%. Latest updated projections that HR submitted in February 2016 seem to confirm this potential showing a reduction of -58% (without existing measures) (with additional measures = -62%).

Additional notes on projections provided in October 2015 (PM2,5 = -27%): HR assumes 4 times more coal use in power plants, but that would only have a minimal impact on the overall PM2,5 emission from this sector (respecting IED-ELVs). HR assumes similar shares for fireplaces, stoves and boilers by 2030 than GAINS, but in addition assumes that 35% of the wood will be applied in pellet boilers/stoves (share of pellets in GAINS is zero). With this high share of pellet consumption, the national projections for residential combustion discussed in October 2015 with COM seem particularly overestimated (even when considering that HR assumes 20% more wood consumption than GAINS) and the GAINS reduction potential could be considered as conservative. Updated projections provided by HR in February 2016 show now much lower emission projections for residential/ commercial combustion than before (reduced from 7.5 kt to 2.6 kt) and are now in line with the GAINS projections. Also emission estimates for domestic combustion for historic years (from 2006 onwards, so not for the base year 2005) have been revised downwards in the February submission (for the year 2013: from 11,1 to 6,3 kt).

Not banking on a full ban of field burning practices (75% instead of 100% ban, to account for incidental firing and enforcement issues) would reduce the reduction potential to around -58%/-60%. The latest national projections that HR reported (February 2016) however do not yet include the impact of any banning of field burning of agricultural waste. Emissions of this activity are also still not reported in HR's emission inventories.

It is also worth to note that on the 29th of February 2016 HR resubmitted its emission inventories for the time-series 1990-2014. This showed that emission estimates were revised on the basis of an recent update of the biomass consumption statistics in the domestic sector. Domestic biomass consumption for the year 2014 was revised upwards from 16,3 PJ (previous estimate) to 42,3 PJ resulting in an increase of the PM2,5 emission for wood combustion in households for the year 2014 from 6,3 to 14,8 kt. The figures for the base year 2005 did not change (not yet updated). It is somewhat strange to note the variation in the space of a year of PM2.5 emission estimates for domestic wood combustion for the year 2013: they went down from 11.1 kt (2015) to 6.3 kt (February 2016) and then back up again to 14.7 kt (March 2016)

This revision of the domestic wood consumption will potentially have an impact on the PM2,5 reduction potential. Without a full updated time series it is difficult to assess the implications, but

preliminary sensitivity calculations that take account of the revised domestic biomass statistics and some reasonable assumptions (based on new information shared by HR) indicate that the impact would not be negative or in worst case could be accommodated within the reduction commitments. The target of -55% that was accepted for the general approach is deemed realistic and achievable.

4. VOC

Updated projections that were provided by HR for the bilateral between COM and HR (October 2015) show a reduction potential of -42% (excluding VOC from agriculture): the main remaining discrepancies on reduction potential with GAINS relate to domestic combustion (conservative national projections) and the omission of field burning of agricultural wastes in Croatia's emission inventories and projections.

- Adding VOC emissions from field burning to the 2005 EI and ban them by 2030 would add 3 % points reduction.
- GAINS assumes more reduction potential for the domestic sector than HR (3 to 4 kt extra reduction corresponding to about 5% extra reduction points). The assumed turnover rates in GAINS (for domestic wood appliances) are already moderate and the few extra PJ of wood consumption in 2030 that HR assumes more than GAINS, does not have to result in a loss in reduction potential of more than 1%. Updated projections provided by HR in February 2016 show now much lower emission projections for residential/ commercial combustion than before (reduced from 9.1 kt to 5.1 kt) and are now in line with the GAINS projections.
- The update of Croatia's biomass balance (higher biomass consumption in domestic than previously estimated) could have some impact on the VOC reduction potential, although much less than on the PM2,5 reduction potential. As mentioned for PM2,5, HR in its latest resubmission of data (29/2/2016) incorporated a major update of its domestic wood consumption, resulting in an increase of its national total VOC emission for the year 2014 from 47 to 53 kt (no revision of base year data).

A correction of the VOC EI for solvent use which has been drastically revised in the 2015 (1) should in combination with the above (ignoring the recent revision of the domestic biomass balance for the time being) make the proposed TSAP16 target of 50% achievable. Nevertheless, a margin of 2% reduction points to account for higher biomass shares (in the time series and the target year 2030) and the possible difficulties to enforce a 100% full ban of field burning of agricultural wastes could be justified. In this context, the GA target of -48% is deemed realistic and achievable and can be supported by HR. The latest projections that were reported by HR (February 2016) seem to indicate that even more reductions for VOC are feasible and realistic.

([1]) the VOC emission inventories in the submission 2016 were revised: the VOC estimates for other solvent use' increased (for the year 2005 with around 9 kt).

5. NH_3

Proposed cost-optimized TSAP16 target of -23% was retained for the general approach. Latest reported projections reported by HR (February 2016) show that much more reduction seems possible. To compensate for a less stringent NOX reduction target HR proposed a tighter NH3 target of -25%.

It should be noted that the NH3 emissions in the 2016 submission were revised downwards, mainly for pigs (and also for, sheep, dairy cattle and poultry). According to the activity data reported in the emission inventory template the reported number of pigs for the base year 2005 was halved from 1,2 to 0,6 million pigs (accordingly also NH3 emissions from pigs for the year 2005 halved from around 10 to 5 kt).

2.5. Cyprus

The analysis below provides the technical explanation for CY on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP	2030 Council	**2030 New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2015)				Reduction commitments new NECD			
	kt	% reduction compared to 2005 national emission total							
SO_2	38.3	37.9	-64	-56	-95	-83	-95	-93	**-93**
NO_X (*)	21.3	20.9	-24	-19	-70	-44	-70	-55	**-55**
$PM_{2.5}$	3.2	2.6	-59	-62	-72	-46	-78	-70	**-70**
VOC (*)	11.4	11.1	-50	-53	-59	-45	-50	-50	**-50**
NH_3	6.0	5.8	-21	-22	-18	-10	-21	-20	**-20**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

In comparison with (new) proposed targets for $PM_{2.5}$, VOC and NH_3 it can be noted that the reported emissions for the last two years (2013-2014) show reductions that are close ($PM_{2.5}$) or already overshooting these targets (VOC and NH_3).

B. Analysis of proposed 2030 targets

1. SO_2

Around 90% of the SO2 emissions in the period 2005-2013 originated from the power stations Moni, Dhekelia and Vasilikos (using heavy fuel). The Moni station has been decommissioned end of 2012. The Dhekelia station and Vasilikos station (restored in 2013 from being damaged in 2011) have been granted a derogation from the LCP directive (ELV of 1700 mg/Nm³ for HFO use) when acceding the EU. This derogation ends when stations are closed or upgraded or NG becomes available or CY starts to export electricity. By 2030 stations will be more than 30/40 years old. If NG does not become available by 2030 (- GAINS assumes a full switch away from HFO to NG in PP stations -), it is fair to assume that the stations will require some upgrade by then or will have to be replaced, at which point stricter ELV's will apply, making a target close to the TSAP16 target of -95% feasible: assuming that in this worst case still 20 to 30 PJ of HFO is fired in 2030, the reduction potential would drop with only about 2% points (to -93%).

According to GAINS also in road transport and domestic and industrial combustion SO2 emissions will drop slightly as a result of activity changes (reduced use of HFO), switch to lower S-content fuels (0,1 S diesel for domestic heating, 10 ppm for transport diesel). The new MCPD will help in delivering the necessary reductions.

2. NO_X

CY updated its NOX projection for road transport increasing the projection from 1,88 to 3,33 kt and bringing it as such more in line with the GAINS projection of 2,75 kt. This reduced the national projection reported to LRTAP in 2015 from -70% to -65%. On the other hand GAINS assumes more reduction potential for the energy sector than CY (due to a complete switch away from heavy fuel oil in PP). If in worst case still 20 to 30 PJ of HFO is fired in 2030 (see also SO2), the reduction potential would drop with only a few percentage points. In this context CY also raised its concern of the possible impact of additional energy demands on (NOX) emissions as a consequence of the expected exploitation of natural gas reserves in its EEZ. If CY were to begin exploitation of this reserve before 2030, it would expect additional energy needs for inter alia the liquefaction of natural gas and the production of ammonia and methanol from natural gas, and hence lead to additional NOX emissions. It can however be argued that the exploitation of natural gas would also generate extra income that could be used for further abatement if necessary.

It can be noted that the lower NOX target of -55% in the general approach implies considerable margin compared to the TSAP16 target of -70%, likely to account for the possible energy needs as explained above. Although a tighter NOX target is in reach for CY, retaining the GA-target of -55 % could be supported given that the proportional loss on the overall PMeq reduction that resulted from the weaker targets in the general approach remained limited.

3. $PM_{2.5}$

Field burning of agricultural wastes was misrepresented in the GAINS model that was used as basis for setting the TSAP16 targets: CY provided an activity in kha that has mistakenly been inserted in GAINS as kg waste burned. Correcting this would lower the target with 2-3% points. Furthermore CY has revised its PM2,5 emission inventory for the energy sector and industry (cement production). The downwards revised 2005 emission estimates for the cement production, together with the correction on field burning would lower the GAINS reduction potential from -78% to -65%.[1] A large part of this loss in reduction potential is neutralized by the reduction potential that has increased for the energy sector because latest reported 2005 estimate more than doubled compared to the reported estimate in 2014. A target between -70% and -75% should be realistic. According to the latest reported projections by CY a reduction of -72% can be achieved by 2030. Retaining the GA-target of -70% could be supported given that the proportional loss on the overall PMeq reduction that resulted from the weaker targets in the general approach remained limited

([1]) In 2011 the 2 existing cement plants were replaced by 1 new one (equipped with FF with PM reduction efficiency of 90%); the historic emissions for the 2 cement plants (closed down), were revised downwards, resulting in loss of reduction potential, since all necessary abatement is already implemented on the new cement plant. The new 2005 estimate for cement is 0,30 kt instead of the previous reported estimate of 1,25 kt)

4. VOC

Proposed cost-optimized TSAP16 target of -50% was retained for the general approach. The target is already achieved according to latest emissions reported for 2013-2014.

5. NH_3

The optimized TSAP16 target of -21% is the result of some activity changes (25% more pigs, 20% less poultry, 5% less dairy cattle but 30% more milk production, 5% less beef cattle, 35% less fertilizer use) and reductions on mainly pigs, poultry (and dairy cattle) farms. GAINS reduction assumptions are moderate and the TSAP16 reduction target is already achieved in 2013/2014. Without a strong growth in the livestock sector (*), this reduction target of -21% should remain achievable by 2030. Cyprus' counteroffer of -20% that was accepted for the general approach only results in a minimal proportional loss of the overall PMeq reduction and can therefore be retained .

(* Note that activity projections for the agricultural sector were not provided by CY to LRTAP).

2.6. Czech Republic

The analysis below provides the technical explanation for CZ on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP	2030 Council	**2030 New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2015)				Reduction commitments new NECD			
	kt	% reduction compared to 2005 national emission total							
SO_2	220.7	208.1	-34	-39	-63	-45	-73	-66	**-66**
NO_X (*)	294.4	279.3	-35	-39	-60	-35	-64	-64	**-64**
$PM_{2.5}$	33.8	34.9	-27	-34	-11	-17	-50	-60	**-60**
VOC (*)	195.8	209.4	-31	-34	-30	-18	-50	-50	**-50**
NH_3	71.4	74.5	-8	-7	+6	-7	-38	-22	**-22**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

Note that the weaker targets for SO2 and NH3 were largely compensated with a much tighter target for PM2.5 (with an extra 10% points reduction above the TSAP16 target of -50%).

B. Analysis of proposed 2030 targets

1. SO_2

Around 75% of the required reductions will - according to GAINS - be delivered by decreased use of lignite in power plants, industry and households, making this assumption the core of the GAINS analysis. Even with considerably more lignite consumption by 2030 than GAINS assumes, the IED, MCPD and BAT conclusions will keep the additional SO2 emission increases limited. For example, a doubling of the GAINS lignite consumption in 2030 in the PP would, with proper application of the ELVs/BAT, reduce the reduction potential only little, to around -70/-71%. Given the compensation that the tighter PM2.5 target provides, the weaker SO2 target of -66% seems reasonable.

2. NO_X

Proposed cost-optimized TSAP16 target of -64% was retained for the general approach.

3. $PM_{2.5}$

Proposed TSAP16 target of -50% could be supported. CZ proposed a tighter target of -60% to compensate for less stringent NH3 and SO2 reduction targets.

4. VOC

Proposed cost-optimized TSAP16 target of -50% was retained for the general approach.

5. NH_3

For the GA agreement CZ accepted a tightening of the PM2,5 target from -50% to -60% to compensate for a weakening of the SO2 target (see above) and the NH3 target (from -38% to -22%). CZ basically finds the proposed target of -38% too stringent, because of its aspiration of self-sufficiency, in particular for pigs.

As usual GAINS mainly identifies reduction potential for poultry, pigs, dairy cattle and inorganic fertilizer use. Applying the GAINS control strategy to the animal numbers as projected by CZ (LRTAP 2015: +85% for pigs, +135% for sheep, +70% for beef, -5% for dairy cattle and -30% for poultry compared to GAINS 2030) would reduce the GAINS reduction from -38% to -27%. The increased production of manure would likely limit however the need for more inorganic fertilizer use as projected by GAINS and (possibly) have a positive impact on NH3 emissions. The extra margin of 5% % points (reducing the GAINS reduction further from -27% to -22%) is certainly sufficient to accommodate the possible different national views on reduction potential for livestock and substitution of urea based fertilizer.

2.7. Denmark

The analysis below provides the technical explanation for DK on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP	2030 Council	**2030 New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2015)				Reduction commitments new NECD			
	kt	% reduction compared to reported 2005 national emission total							
SO_2	24.3	25.8	-50	-56	-52	-35	-62	-52	**-59**
NO_X (*)	177.1	188.2	-42	-47	-71	-56	-66	-58	**-68**
$PM_{2.5}$	27.4	28.7	-26	-36	-53 ([6])	-33	-56	-41	**-55**
VOC (*)	112.1	111.9	-32	-39	-73	-35	-49	-37	**-37**
NH_3	77.0	88.9	-17	-17	-27	-24	-32	-24	**-24**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

It should be noted that the latest national projections that DK reported show steeper reductions than the general approach 2030 targets for NO_X, VOC and NH_3.

Other options than proposed in the table above can achieve the same health impact reduction: For instance a tighter SO_2 target of -62% would compensate for a lower NH_3 target of -25%.

B. Analysis of proposed 2030 targets

1. SO_2

According to the TSAP 16 analysis most reductions will be delivered in the Power Plant sector as a result of activity changes (more biomass and REN, less coal and HFO) and application of controls (IED, BAT-LCP), industry (less heavy fuel oil, implementation of IED, MCPD), domestic (less diesel and coal) and navigation (SECA). It should be noted that the reduction achieved in 2014 compared to 2005 is -56%, thus already overshooting the target that was accepted for the General Approach. Note also that a recent downwards recalculation of the SO_2 emissions from ceramics (category NFR2A6) after most recent national projections, showing a CLE (WeM) reduction of -52%, were elaborated, may add a few extra % points to the projected national reduction potential. A target of -59% should provide sufficient comfort to account for different assumptions in the use of S-containing fuels in the energy sector, industry and households.

[6] 2030 projections for $PM_{2.5}$ were not reported: the -53% is the CLE GAINS 2030 projection.

2. NO_X

The latest reported national projections submitted to COM/UNECE (2015), showing a reduction of -71% by 2030 when excluding NOX from agriculture, confirm that the proposed target of -66% could be feasible and acceptable.

According to the TSAP 16 analysis, 70% of the required reduction will be delivered by road and non-road transport (fleet renewal to euro 6, stage IV), 22% by the PP sector (switch from coal to gas and REN; CLE control) and 6% by industry (refineries and other: activity changes and application of IED-ELVs, MCPD-ELVs and new BATAELs).

In view of its national projections for NOX, DK is willing to increase the TSAP16 target with 2% (from -66% to -68%, in order to compensate for a less stringent NH3 reduction target.

3. $PM_{2.5}$

Denmark has not provided PM2,5 projections to LRTAP or COM recently, nor other information that can provide sufficient counter-evidence to the GAINS analysis for DK on PM2,5. With a reduction target of -56% DK will have to decrease its PM2,5 emission total from 28,7 kt in 2005 to 12,6 kt in 2030. The level reached in 2014 was 18,4 kt.

According to GAINS, most of the reductions will be delivered in domestic combustion (renewal of wood stoves and boilers in CLE scenario), followed by fleet renewal in road and non-road. Banning of field burning of agricultural wastes and small scale open burning of wastes will deliver an extra 1 to 2 reduction points.

Crucial in the achievability of the proposed target of -56% will be the turn-over rate of domestic boilers and stoves. GAINS assumptions are rather moderate for stoves (towards 35% no control (NOC), 35% improved (IMP), and 30% NEW), but rather ambitious for manual boilers (100% to pellet boilers). DK has since 2005 implemented measures to reduce emissions from residential wood combustion (i.a. statutory order of 2008, revised in 2014) and will have to maintain its efforts in order to reach compliance with its PAH ceiling of the LRTAP-POP protocol. The new Eco-design standards for domestic solid fuel boilers and local space heaters will certainly help to keep DK on track. In order to reach the proposed 2030 target of -56%, PM2,5 emissions of residential combustion will - according to GAINS - have to be brought down from 14.9 kt in 2005 to about 6,4 kt in 2030. The reported PM2.5 emission for residential combustion in 2014 is at 10.7 kt (down from 16.1 kt in 2005). A margin of 0,3 kt (1% point reduction) (to account for different stock turn over, wood consumption or lower emission performance of new appliances) seems to provide sufficient comfort for DK, which could support a target of -56%.

4. VOC

The reported national projections submitted by DK to UNECE early 2015 and resubmitted to COM in December 2015 (NECD) show a reduction potential of -73% (excluding VOC from agriculture), greatly exceeding the proposed target of -49%, which - according to the GAINS analysis - can almost be achieved on the basis of current legislation (CLE = -48%). The proposed TSAP16 target of -49% could therefore be acceptable. Denmark's GA target of -37% is only 2% points above the 2020 target of -35%, and according to the latest reported emission estimates the reduction in 2014 is already -39%.

According to GAINS the required reductions will mainly be delivered in domestic combustion (19%), road transport (39%), non-road mobile machinery (17%) and solvent use (20%), partially through activity changes and partially through CLE control (Euro standards, NRMMD, replacement of wood stoves and ED-standards, Deco-paint D, IED). To account for different future developments than GAINS projected (e.g. a higher share of gasoline cars in 2030) a margin of around 3% points would be justified.

Notwithstanding the above, it was difficult for DK to support a target beyond -37% for VOC. Given the minimal impact this would have on the overall ambition in health impact reduction and given that DK can support much tighter targets for SO2, NOX and PM2.5 than agreed to in the general approach (in line with the aim of reaching a 50% ambition at EU level), this seems reasonable.

5. NH_3

According to its latest submitted projections to LRTAP (March 2015), DK would be able to reduce its NH3 total with -27% compared to the 2005 level. Compared to the 2020 target of -24%, this means an extra effort of 3% (2,5 kt). GAINS identifies the largest reduction potential for pig farms. TSAP 16 also calculated a reduction potential of 3% points for the non-agricultural sources (mainly from gasoline cars) (see also reported NH3 emission change for gasoline cars between 2005 and 2013: decrease of 1,8 kt). It is not clear to what extent the few percentage points reduction potential from the non-agricultural sources has been taken into account in Denmark's projections (no sectoral data were reported, only national totals).

DK proposed retaining the NH3 target of -24% that was accepted for the general approach while making additional efforts on the other pollutants (see above).

2.8. Estonia

The analysis below provides the technical explanation for FI on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP	2030 Council	**2030 New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2015)				Reduction commitments new NECD			
	kt	% reduction compared to 2005 national emission total							
SO_2	75.7	76.3	-52	-46	-68	-32	-72	-68	**-68**
NO_X (*)	37.3	40.3	-18	-20	-27	-18	-46	-30	**-30**
$PM_{2.5}$	20.4	14.1	-24	-45	-20	-15	-41	-41	**-41**
VOC (*)	37.4	28.4	-36	-38	-49	-10	-28	-28	**-28**
NH_3	10.2	10.6	+21	+23	+30	-1	-1	-1	**-1**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

B. Analysis of proposed 2030 targets

1. SO_2

According to the GAINS analysis most reductions will be delivered by a drop in the use of oil shale in power plants and more emission control on the remaining part (desulphurisation technology). The GAINS national scenario that integrated all Estonia's assumptions on energy projections will still deliver a reduction of -62%. Additional reduction is possible on oil shale gas firing (desulphurisation; up to applying general ELV of 35 mg/Nm³) or on oil shale firing (new BATc). A target of -68% is deemed realistic and achievable.

2. NO_X

According to the GAINS analysis most reductions will be delivered by a drop in the use of oil shale in power plants, renewal of vehicle fleet (Euro 6 shares in 2030 not disputed by EE) and NRMM.

The GAINS national scenario that integrates Estonia's national assumptions on energy projections and process activity projections for 2030, while keeping assumptions on control strategies and emission factors unchanged, delivers a reduction of 31% by 2030 (CLE). The remaining gap of 15 % points (about 6 kt) is due to the higher activity rates assumed by EE for oil shale gas, shale oil production (235PJ vs 138PJ), diesel and gasoline used in road transport (25 and 14PJ vs 19 and 9PJ), cement production (1.82 Mt vs 0.66 Mt) and biomass use in the energy sector (35PJ vs 15PJ).

EE argued that the GAINS activities for oil shale do not derive from PRIMES. For reasons of EU-wide consistency, activity levels which differ from PRIMES are normally only used for sensitivity analysis. However using Estonia's assumptions on oil shale input instead of the contested PRIMES figures (and related activities as combustion of shale oil gas and cement production using the oil shale ash) would reduce the proposed target from -46% to -36%.

A higher use of biomass in PP as assumed by EE could be compensated by less use of other fuels (gas). Additional cost-effective reductions are available in a scenario based on higher oil shale input, capable of delivering additional reductions beyond -36%, in particular for the energy sector and industrial combustion (through application of the IED-ELVs, new expected BATc for LCPs and new MCPD-ELVs), and hence making a target of more than -36% reasonable. This said, given the fact that the net loss of the targets proposed by EE for the general approach on health impact reduction compared to the TSAP16 targets is still acceptable and taking account of the recent recalculation of the emission inventory (see note below), more margin on NOX is justified. Retaining the target of -30% that was accepted for EE in the general approach is in this context still reasonable .Note that the NOX emissions in the 2016 submission were significantly revised upwards: NOX emissions from residential heating for the base year 2005 were recalculated to 5,7 kt (previous estimate was 1,2 kt).

3. $PM_{2.5}$

Proposed cost-optimized TSAP16 target of -41% was retained for the general approach. The target is already achieved according to latest emissions reported for 2014 (LRTAP 2016 submission).

Note that the PM2,5 emissions in the 2016 submission were significantly revised downwards: PM2,5 emissions from residential heating for the base year 2005 were recalculated to 2,7 kt (previous estimate was 9,0 kt).

B.4. VOC

Proposed cost-optimized TSAP16 target of -28% was retained for the general approach. The target is already achieved according to latest emissions reported for 2013 and 2014 (LRTAP 2016 submission).

Note that the VOC emissions in the 2016 submission were significantly revised downwards: VOC emissions from residential heating for the base year 2005 were recalculated to 4,3 kt (previous estimate was 12,6 kt).

5. NH_3

Proposed cost-optimized TSAP16 target of -1% was retained for the general approach.

2.9. Finland

The analysis below provides the technical explanation for FI on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP	2030 Council	**2030 New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2015)				Reduction commitments new NECD			
	kt	% reduction compared to 2005 national emission total							
SO_2	68.8	69.6	-32	-38	-58	-30	-34	-34	**-34**
NO_X (*)	184.1	187.0	-23	-26	-44	-35	-47	-47	**-47**
$PM_{2.5}$	34.7	35.3	-5	-32	-46	-30	-34	-34	**-34**
VOC (*)	117.8	134.4	-30	-44	-53	-35	-48	-48	**-48**
NH_3	39.6	39.2	-5	-6	-13	-20	-20 [-15]	-20	**-20**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

B. Analysis of proposed 2030 targets

1. SO_2

Proposed cost-optimized TSAP16 target of -34% was retained for the general approach. The target is already achieved according to latest emissions reported for 2014.

2. NO_X

Proposed cost-optimized TSAP16 target of -47% was retained for the general approach.

3. $PM_{2.5}$

Proposed cost-optimized TSAP16 target of -34% was retained for the general approach. Emission reduction achieved in 2014 according to latest reported emissions is already -32%.

4. VOC

Proposed cost-optimized TSAP16 target of -48% was retained for the general approach. Emission reduction achieved in 2014 according to latest reported emissions is already -44%.

5. NH_3

The stricter 2020 Gothenburg Protocol target of -20% was retained for the 2030 target in the general approach. Flexibility is proposed in the general approach that allows temporary non-compliance of a target that is more stringent than the cost-effective reduction identified in TSAP16 (-15% in this case) if compensated on another pollutant.

2.10. France

The analysis below provides the technical explanation for FR on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP -52.2%	2030 Council -48.3%	**2030 New -49.6%**
	GAINS (2014)	Reported emissions (2016) and projections [7]				Reduction commitments new NECD			
	kt		% reduction compared to 2005 national emission total						
SO_2	464.7	467.0	-53	-64	-65	-55	-77	-75	**-77**
NO_X (*)	1398.6	1428.7	-32	-38	-67	-50	-69	-69	**-69**
$PM_{2.5}$	244.7	254.8	-25	-34	-52	-27	-56	-56	**-57**
VOC (*)	1216.5	1189.0	-41	-46	-53	-43	-52	-52	**-52**
NH_3	693.6	685.5	+1	+3	-12	-4	-23	-13	**-13**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

In comparison with the TSAP 16 target for SO_2 of -77% it is worth noting that reported emissions for the last two years (2013-2014) already show a reduction of around -65%. Also for VOC the remaining distance to target is not that far anymore (-46% vs -52%).

B. Analysis of proposed 2030 targets

1. SO_2

Latest WeM projections provided by FR for 2020 show a reduction of already -65% compared to 2005. The achieved reduction in 2014 compared to 2005 is -64%.

According to GAINS most reductions will be delivered by phase out / strong drop in use of coal and HFO in power plants, industrial combustion plants and small combustion plants (households), (CLE) emission controls on the refineries (feasible with new BATC for refineries) and other industry and navigation (SECA). The TSAP16 target of -77% is challenging (close to MTFR), but possible (keeping in mind new MCPD, new BATc for LCP and refineries ...). Given that NH3 is the pollutant of main concern, FR could support to reinstate the TSAP16 target of -77% (2% points tighter than the general approach target): Together with the additional effort on PM2.5 FR proposed, it provides the relaxation on NH3 that FR requested.

2. NO_X

Proposed cost-optimized TSAP16 target of -69% was retained for the general approach.

According to the GAINS optimization 65% of the required NOX reduction to reach the proposed target of -69% will be delivered in the road sector (mainly turn over to Euro 6), 16% by non-road

[7] in absence of national reported projections for 2030 by FR, the reported projections for 2020 are shown in table (reported in 2015), except for NOX for which the 2030 CLE GAINS projection is shown in table

mobile machinery (mainly renewal) and the remaining part in energy, industry and domestic (mainly activity changes). France submitted projections to UNECE in February 2015 for the year 2020. These projections show a reduction of -56% compared to the 2005 total. There is a good match between FR's projections for 2020 and GAINS for 2030 for all sectors, except for road, which is understandable because shares of euro 6 vehicles are still much lower in 2020 than in 2030. Further fleet renewal between 2020 and 2030 should result in additional reductions (around 180 kt which corresponds to 13% reduction points,) closing the gap to the proposed national target of -69%. The discrepancy with the projection of -64% that FR provided to the PRES in Nov 2015 was likely the result of the fact that FR has used a higher conformity factor than 1,5 or was assuming les fleet turnover by 2030. GAINS assumes for 2030: 90% euro 6 gasoline cars, 84% euro 6 diesel cars and 98% euro 6 diesel trucks.

3. $PM_{2.5}$

Proposed cost-optimized TSAP16 target of -56% was retained for the general approach. There is overall a good match between the GAINS 2030 projections and reduction potentials and France's latest reported projections to UNECE (albeit these were projections for 2020, showing a reduction potential of -52% compared to the 2030 potential of -56%).

The combined potential of banning field burning of agricultural residues and small scale waste burning, not considered in France's projections, is assessed at 5 kt. This accounts for an additional 2 percentage points in the resulting reductions vs 2005. The remaining discrepancy in reduction potential (-54% vs -56%) is mainly the result of differences in assumptions and reduction potential for stationary industry (combustion, process). Given that France's main pollutant of concern is NH3, FR proposed to tighten its TSAP16 PM2.5 target of -56% (accepted for the general approach) with one extra % point (in exchange for a weakening of the NH3 target).

4. VOC

Proposed cost-optimized TSAP16 target of -52% was retained for the general approach.

There is overall a good match between the GAINS 2030 projections and reduction potentials and France's latest reported projections to UNECE (albeit these were projections for 2020, showing a reduction potential of -53%). Achieved reduction in 2014 is already -46%. GP 2020 target is -43%.

5. NH_3

Besides substantial potential to reduce emissions from poultry and to a lesser extent potential to reduce emissions from pigs and cattle (dairy, beef), GAINS also identifies reduction potential to reduce emissions from the use of mineral fertilizer.

Assumptions on mineral fertilisers seem to be the most important point of divergence between GAINS and the national FR projections. FR disagrees with the high substitution rate of urea based fertilizer (60%) that GAINS assumes, although on average much higher substitution rates are assumed for most of the other MS. FR believes that the costs associated with the use of ammonium nitrate as substitute for urea based fertilizer were underestimated and referred in information previously communicated to new urea production capacity in North Africa. It can be noted in this context that alternatives to substitution of urea based fertilizer exist that also achieve high reduction

efficiencies (e.g. quicker incorporation into the soil, injection into the soil, use of urease inhibitors, irrigation of the field after application).

When comparing reported emissions and activity data for the agricultural sector between the year 1990 and 2005, it appears that FR made limited progress in reducing its NH3 emissions from this sector in this period: the implied emission factors (emission per animal head) remain more or less at the same levels between 1990 and 2005. This is i.a. the reason why GAINS identifies substantial potential to reduce emissions from poultry, reflecting the limited measures taken in the sector in the past. Overall FR would only be required to take a combination of cheaper measures for poultry, pigs and cattle, mainly consisting of LNA, LNF and CS (total cost for livestock is around 340 EUR/ton) (EU average is 560 EUR/ton).

FR does not fully recognize the potential that GAINS identifies and argues that some of these measures have already been implemented by 2005 - although not reflected yet in reported emissions. It also claims that some measures have lower applicability possibilities because of geographical and other restrictions than GAINS assumes and emphasises the difficulties to fully enforce certain measures on farmers. Furthermore, in particular for cattle, FR expects a higher animal number than GAINS. FR expects a similar activity level for cattle in 2030 as current levels, while GAINS projects a decrease of 20% dairy and 10% beef between 2005 and 2030. FR believes that all this would result in a lower reduction potential than GAINS calculated, but did not provide alternative figures that could be compared against the GAINS analysis. Due to the lack of information provided by FR to further elaborate on their position, a rough sensitivity analysis on more beef and dairy cows in 2030 and less reduction potential available on low manure application (and feeding strategies) for pigs and poultry (about 20% less) resulted in a loss of reduction potential of around 6 to 7% points (4% to account for more cattle and 2 to 3% to account for less reduction potential for pigs and poultry).This would result in a lower target of -16% / -17%.

However, FR proposed additional efforts on SO2 and PM2.5 (see above), in order to maintain a reduction commitment of -13% for NH3 that would result in the same health impact reduction (remaining at about 3% relaxation of PMeq reduction).

2.11. Germany

The analysis below provides the technical explanation for DE on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030	2030	**2030**
							COM/EP	Council	**New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2015)				Reduction commitments new NECD			
	kt	% reduction compared to 2005 national emission total							
SO_2	457.5	473.7	-13	-18	-38	-21	-57	-58	**-58**
NO_X (*)	1429.9	1457.9	-21	-24	-54	-39	-64	-64	**-65**
$PM_{2.5}$	122.0	130.7	-15	-20	-32	-26	-42	-42	**-43**
VOC (*)	1184.7	1135.0	-21	-27	-16	-13	-35	-24	**-28**
NH_3	587.5	678.3	+8	+9	+6	-5	-38	-29	**-29**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

Note that the emission reduction achieved in 2014 for VOC according to the latest reported emissions (LRTAP submission 2016) is already steeper than the VOC target accepted for the general approach (-27% vs. -24%).
The analysis below shows that additional reductions for SO_2 and NO_X beyond their TSAP16 targets are feasible in a scenario that would include more ambitious climate measures. In Germany's national EWS+ scenario (Energiewende – Szenario: DE's scenario with more climate policy) the projected total inland consumption of fossil fuels by 2030 is projected to be much lower than in GAINS, enabling DE to accept (slightly) tighter targets for SO_2, and NO_X and even PM2.5. These tighter targets can compensate for the requested strong weakening of the NH3 target. Key focus of action is on the energy sector (power plants).

B. Analysis of proposed 2030 targets

1. SO_2

DE proposed for the general approach a target of -58% (1% tighter than the proposed TSAP16 target of -57%) to compensate for a less stringent NH3 reduction target.

In order to keep the deviation from the overall PMeq reduction achieved with the TSAP16 targets to an acceptable level for DE, it has the option to tighten its NH3 target back from the GA target of -29% to -32% or to compensate with tighter targets on other pollutant(s).

Given that a NH3 target of -29% is the maximum acceptable (see below), the other option to tighten the targets for SO2, NOX and/or PM2.5 instead for which some margin is left in a scenario that would include more ambitious climate measures, is a reasonable alternative. In Germany's national EWS+ scenario (Energiewende – Szenario: DE's scenario with more climate policy) the projected total inland consumption of fossil fuels by 2030 is projected much lower than in GAINS. This will have a positive

impact on particular SO2 and NOX emissions. The use of fossil solid fuels (lignite and coal) in power plants will drop by 2030 in the EWS+ scenario below 700 PJ, which is more than 500 PJ less than what GAINS projected in 2030 (around 1200 PJ). This reduced use of fossil fuel use in power plants of around 500 PJ alone will deliver more than enough extra SO2 emission reduction to enable a national reduction of -58%, one % above the cost-optimized TSAP16 target of -57%. Even if this additional drop in fossil fuel use would not fully materialize in reality by 2030 there is additional reduction potential available by implementing more (efficient) control on power plants in line with the IED-ELVs and new emerging BATAELs for LCP's.

2. NO_X

Proposed cost-optimized TSAP16 target of -64% was retained for the general approach.

Reductions are mainly to be delivered in road transport (CLE), non-road (CLE) and PP (less lignite, hard coal).

In order to keep the deviation from the overall PMeq reduction achieved with the TSAP16 targets to an acceptable level for DE, it has the option to tighten its NH3 target back from the GA target of -29% to -32% or to compensate with tighter targets on other pollutant(s).

Given that a NH3 target of -29% is the maximum acceptable (see below), the other option to tighten the targets for SO2, NOX and/or PM2.5 instead for which some margin is left in a scenario that would include more ambitious climate measures, is a reasonable alternative. In Germany's national EWS+ scenario (Energiewende – Szenario: DE's scenario with more climate policy) the projected total inland consumption of fossil fuels by 2030 is projected much lower than in GAINS. This will have a positive impact on particular SO2 and NOX emissions. The use of fossil fuels (lignite, coal and gas) in power plants will drop by 2030 in the EWS+ scenario below 700 PJ, which is more than 500 PJ less than what GAINS projected in 2030 (around 1200 PJ). This reduced use of fossil fuel use in power plants of around 500 PJ alone will deliver more than enough extra NOX emission reduction to enable a further tightening of the NOX target to -65%. Even if this additional drop in fossil fuel use would not fully materialize in reality by 2030 there is additional reduction potential available by implementing more (efficient) control on power plants in line with the IED-ELVs and new emerging BATAELs for LCP's.

3. $PM_{2.5}$

Proposed cost-optimized TSAP16 target of -42% was retained for the general approach. According to the GAINS analysis respectively around 45% and 20% of the required reductions will be delivered by road transport (renewal to euro 5/6) and non-road mobile machinery (renewal to stage IIIb/IV) . Furthermore:

- the appropriate combination of less solid fuels in the energy sector and industry (combustion) and strict application of the IED-ELVs, new MCPD-ELVs and new emerging BATc for LCPs would deliver sufficient emission reductions in these two sectors;
- maintaining PM2,5 emissions from domestic wood combustion to acceptable levels would involve (proper) limitation on the use of biomass in households, use the majority of increased biomass in cleaner technologies (e.g. boilers) and the strict implementation of ED-limits/national legislation on SCI.

For the same reasons as explained above for NOX and SO2, DE also proposed to tighten its PM2.5 target with 1% to -43%.

4. VOC

Latest update of projections that DE provided show that DE believes that VOC emissions can be reduced from 1137 kt in 2005 to 890 kt in 2030 (= -22%). On top of it DE sees additional reduction potential for mainly solvent use (around 80 kt): half of this reduction potential would require revision of EU legislation (Deco-paint Directive) and the other half of the reduction potential would require additional national action on sources (preferably supported by BREF revisions - IED): an additional 40 kt reduction would bring DE to -25%.

COM's analysis of the GAINS and national cost effective reduction potential (-35% vs -22%) showed that there is additional reduction potential available beyond Germany's projections from (1) refineries and gasoline distribution (around 15 kt: drop in activity ...), (2) domestic wood combustion (around 10 kt: application of strict standards, diverting biomass to cleanest technologies and/or larger plants, limit use of wood in households) and (3) road and non-road (around 15 kt: less gasoline, Euro 5/6, stage IIB, IV)., resulting together in an extra 4% reduction points.

GAINS also identified more reduction potential (CLE) for solvent use than DE.

All things considered a reduction close to 30% should be realistic. Going down to -28% should provide DE sufficient margin: it would be only 1% reduction point above the reduction achieved in 2014 (-27%) and already 3% points away from the reduction that according to GAINS can be achieved in 2030 with CLE (-31%). National reported VOC emissions went down considerably between 2013 and 2014, mainly as the result of lower emissions from the solvent use activities (coating).

5. NH_3

DE indicated that the TSAP16 target of -38 % is technically feasible only if measures are applied at extreme application rates. Lowering the target from -38% to -29% as accepted for the general approach would put less pressure on DE to implement the more expensive measures for cattle and pigs slurry systems as identified by GAINS and be more flexible on substitution of urea based fertilizers (substitution rate is set at 90% in GAINS for DE). The lower target of -29% would also help DE to deal with the inclusion of emissions from biogas production in the 2030 targets - a recently emerged new source of emissions - since the overall technical feasibility of emission reductions decreases when this emission flux of biogas production is taken into account. To compensate for the weaker NH3 target of -29%, DE proposed tightening its targets for SO2, NOX and PM2.5 with 1% above the respective TSAP16 targets for these pollutants (see above).

2.12. Greece

The analysis below provides the technical explanation for EL on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030[8] WeM	2020	2030	2030	**2030**
							COM/EP	Council	**New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2014)				Reduction commitments new NECD			
	kt	% reduction compared to reported 2005 national emission total							
SO_2	529.3	540.7	-74	-74	-75	-74	-92	-88	**-88**
NO_X (*)	401.5	416.5	-40	-39	-68	-31	-69	-50	**-55**
$PM_{2.5}$	60.5	60.5	0	0	-51	-35	-71	-45	**-50**
VOC (*)	263.2	220.4	-44	-46	-53	-54	-64	-62	**-62**
NH_3	57.9	67.5	-10	-10	-7	-7	-31	-10	**-10**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

B. Analysis of proposed 2030 targets

1. SO_2

According to the GAINS optimization most of the reductions (almost 80%) will be delivered in the energy sector (PP), mainly by drops in lignite, coal and heavy fuel oil, with the reduced use of lignite from 80 PJ in 2005 to 45 PJ in 2030 delivering most of the reductions. In case Greece would expect double the use of lignite (in PP) by 2030 than GAINS assumes (meaning no drop of lignite use from the 2005 consumptions), proper implementation of the IED-LCP, MCPD and new BAT conclusions for LCP, would still allow Greece to keep its SO2 emissions in the energy sector under control. For example, an additional use of 40 PJ lignite would only lead to a loss in reduction potential of about 2% points. The new MCPD-ELVs will contribute to reduce the SO2 emissions from Greece's diesel engines. The new BAT conclusions established for refineries and other industries, the use of less diesel (with lower S-content → 0.1%) for domestic combustion and the switch to 0.5% S for use on ships, together with further activity changes in industry (reduced use of S-containing fuels) will deliver the necessary reductions in industry, domestic and navigation. Although a high reduction target than the -88% that Greece accepted for the general approach seems feasible, a target of -88% would still contribute sufficiently to achieve the necessary health impact reduction. Note that the reported emissions for 2013 and 2014 already show a reduction of 74%.

2. NO_X

According to the GAINS optimization 39% of the required NOX reduction to reach the proposed target of -69% will be delivered in the road sector (mainly fleet renewal to Euro 6), 10% by non-road

[8] No projections were provided for 2030. For 2020, projections were reported for SO_2, NO_X, VOC, NH_3. Thus in these 2030 estimates, the figures for SO_2, VOC and NH_3 are those from the 2020 projections, while for NO_X and $PM_{2.5}$ the CLE GAINS 2030 projections are shown.

mobile machinery (mainly renewal), 44% by the energy sector (mainly activity changes: switch to gas and REN, decreased use of coal, lignite and HFO; strong decrease in use of diesel engines) and remaining part mainly by industry (cement: implementation of BAT).

Greece did not provide any detailed information on its national analysis of the proposed targets. The most reasonable assumption is that the energy sector is key in the achievability of the proposed target: in particular in relation to Greece's diesel engines and the continued higher use of solid and liquid fuels than GAINS assumes in the energy sector. A margin of 5% points from the proposed target (around 20 kt) should provide Greece sufficient comfort to deal with any deviations from the GAINS/PRIMES scenario for Greece's energy sector, in particular also given the fact that with the new MCPD (including ELVs for diesel engines) and the new tighter emerging BATAELs for LCP additional reduction potential for this sector will become available.

A margin of 3% points should be sufficient to account for possible lower shares of euro 6 (and 5) in 2030 in road transport due to the economic crisis that has hit Greece very hard. An additional margin of 2% to accommodate possible discrepancies in the other sectors (non-road, domestic) would make a target of -59 % reasonable and achievable. GR could support a target of -55%, again still contributing sufficiently to achieve the necessary health impact reduction for GR.

3. $PM_{2.5}$

Greece has so far never reported emissions inventories for PM2,5 to UNECE (LRTAP) or the COM (NEC), nor has Greece provided any information to the COM on its analysis of achievability of the proposed TSAP16 target of -71%.

According to GAINS 42% of the required reductions to meet the proposed target of -71% will be delivered in the energy sector (mainly by decrease in coal and lignite use, decrease in diesel engines), 21% in the domestic combustion sector (mainly by a moderate drop in wood use and renewal of wood stoves), 17 % by a ban of field burning of agricultural wastes and small scale open waste burning, 11% in the road transport (fleet renewal to euro 5/6: in 2030: 78% euro 6 trucks, 95% euro 6 diesel cars, 66% euro 6 diesel LDV) and 8% in the non-road mobile machinery sector (fleet renewal to stage IIIb/IV).

GAINS assumptions seem overall reasonable and in absence of contradicting information, there is no reason to question the achievability of the calculated reduction potentials. However, to accommodate Greece's concerns on the achievability of the TSAP16 target margin could be allowed for the key sectors here (energy sector, domestic wood combustion and field burning of agricultural wastes):

- The renewal rates for domestic fireplaces, stoves and boilers assumed in GAINS are: from 100 % no control in 2005 to 97% improved in 2030 for fireplaces; from 67% no control in 2005 to 100% new/pellet in 2030 for boilers; and from 76% no control in 2005 to 85% improved/15% new in 2030 for stoves. A less ambitious control strategy for domestic wood combustion (from 100 % no control in 2005 to 100% no control in 2030 for fireplaces; from 67% no control in 2005 to 35% no control/45% improved and 20% new in 2030 for boilers; and from 76% no control in 2005 to 50% no control/35% improved/15% new in 2030 for stoves) would reduce the national target from -71% to -64%.

- A 75% ban of field burning practices (instead of 100% ban assumed in GAINS), to account for incidental firing and enforcement issues, would reduce the reduction potential for GR further to -62%.
- As explained also for SO2 and NOX, a higher use of lignite or liquid fuels in the energy sector (conventional PP, diesel engines) by 2030 than GAINS assumes could result in additional PM emissions and further reduce the overall reduction potential. With proper implementation of the IED-LCP, MCPD and new BAT conclusions for LCP, PM2.5 emissions in the energy sector can be kept under control. A additional margin of 4% points (around 2.5 kt) should provide Greece sufficient comfort to deal with any deviations from the GAINS/PRIMES scenario for Greece's energy sector.

Thus a reduction target of -58% would seem reasonable and achievable. GR can accept a target of -50%, 5% points tighter than the target it accepted for the general approach. Together with the tighter target it could support for NOX, it is just enough to keep GR on track in delivering comparable efforts towards an EU ambition of 49,6%.

4. VOC

The 2020 GP target is set at -54% (10% points below the 2030 target of -64%). According to its latest provided projections for 2020, GR believes it will achieve the 2020 target by 2020.

According to the TSAP16 analysis most reductions to achieve the TSAP16 target of -64% in 2030 will be delivered in road transport (46%), non-road mobile (12%), domestic combustion (15%), power plants (5%), solvent use (9%), refineries and distribution (7%) and field burning (5%).

A margin of 2 % points as accepted for the general approach is deemed sufficient, in particular, the possible discrepancies for the domestic combustion sector (see also PM2.5).

5. NH_3

According to GAINS part of the NH3 reductions will be delivered by activity changes (e.g. fewer pigs and sheep, less mineral fertilizer use) and part will be delivered by already agreed reductions in current legislation (CLE) and additional control (pigs, poultry, cattle, sheep). A relevant part will also come from the replacement of old gasoline vehicles (euro 1 and 2) and banning of field burning of agricultural wastes: this part alone will deliver around 8% reduction points compared to the 2005 national total.

The reduction potential that GAINS identified for livestock mainly includes the cheaper measures like low nitrogen feeding, coverage of manure and low NH3 manure spreading. Maintaining activity levels for dairy cattle, pigs, sheep and mineral use at the 2005 levels would with the application of the GAINS control strategy reduce the reduction potential from -31% to around -20%. The GA target of -10% is the reduction that it currently achieves (2013/2014).

2.13. Hungary

The analysis below provides the technical explanation for HU on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP	2030 Council	**2030 New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2015)				Reduction commitments new NECD			
	kt	% reduction compared to reported 2005 national emission total							
SO_2	42.9	41.3	-26	-34	-56	-46	-73	-73	**-73**
NO_X (*)	150.4	155.7	-32	-32	-50	-34	-66	-66	**-66**
$PM_{2.5}$	32.4	27.0	+3	-4	-38	-13	-64	-48	**-55**
VOC (*)	130.2	122.6	-19	-23	-36	-30	-58	-58	**-58**
NH_3	78.9	89.0	-7	-6	-16	-10	-43	-25	**-32**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

Note that the targets for PM2.5 and NH3 as presented in document 10607/16 were adjusted after the COREPER meeting of 29 June 2016: the proposed PM2.5 target of -58% was weakened to -55%; to maintain the same health impact reduction the NH3 target was tightened from -27% to -32%.

B. Analysis of proposed 2030 targets

1. SO_2

Proposed cost-optimized TSAP16 target of -73% was retained for the general approach.

Most SO2 emissions can be attributed to the use of solid fuels (lignite, coal) in the energy sector (power plants) and households. Most reductions will delivered by reduced use of these solid fuels (and more emission control).

2. NO_X

Proposed cost-optimized TSAP16 target of -66% was retained for the general approach.

3. $PM_{2.5}$

According to the GAINS analysis 55% of the required reduction to achieve the TSAP16 target of -64% will be delivered by activity changes and stock renewal in domestic combustion (mainly in wood combustion), 20% by fleet renewal in road and non-road transport, 6% in the power plant sector by mainly less lignite use, 7% in industry (iron and steel, Al production, other) and 10% by banning field burning of agricultural wastes and small scale open burning.

HU has raised particular concerns regarding the assumptions used in GAINS for domestic heating, currently HU's major source of PM2,5 emissions, including significant differences in fuel split and

rates of controlled capacities of residential stoves and boilers between GAINS and national views for 2030, resulting in a difference in emissions of around 5 kt (around 15% of 2005 national total). HU assumes a much slower turn over to improved and new stoves and boilers (closer to GAINS CLE).

A more moderate renewal rate than assumed in GAINS (about halfway between OPT and CLE) would result in around 8% point loss in reduction potential. Not banking on a full ban of field burning practices (75% instead of 100% ban, to account for incidental firing and enforcement issues) would reduce the reduction potential further with another 1% (to be noted that emissions of this activity are not yet accounted for in HU's emission inventories). On this basis a target of -55% (-64% -8% -1%) is deemed realistic and achievable.

4. VOC

Proposed cost-optimized TSAP16 target of -58% was retained for the general approach.

5. NH_3

In its submission 2015 Hungary revised its NH3 emissions for the use of mineral fertilizers in line with the revised EF for this activity included in the latest edition of the EMEP guidebook (edition 2013). This increased the national total for 2005 from 79 kt to 89 kt (confirmed by 2016 submission). The net impact of the revision of EF of fertilizers on the overall reduction potential is likely small, especially when considering that a higher number of pigs than assumed in GAINS (see below) will lead to less supplementary use of mineral fertilizer (more manure being produced) (see GAINS national scenario).

Hungary mainly questions the following assumptions used in the GAINS analysis:

- values of N-excretion for poultry used in GAINS, which HU points out are high compared to the EMEP GB values and compared to the values used for other MS;
- the control strategy for other poultry assumed in GAINS, which HU considers too ambitious considering that 'other poultry' consist for a large part (around 30% in 2005) in HU of ducks, geese and turkeys, normally kept on smaller farms[9] ('other poultry' includes other poultry than broilers);
- animal projections in GAINS are below national projections, in particular for pigs (note that the projected strong increase in pigs by HU - more than double the GAINS projection - is currently not reflected in reported activity data for pigs showing a gradual decrease between 2005 and 2014 of around 25% (from 4 to 3 million, which is the level that is assumed by GAINS for 2030))

To account for these concerns, in particular for the revitalisation of the agricultural livestock sector and the apparent high excretion values for poultry used in GAINS, which potentially inflated the reduction potential for this sector, a relaxation of the NH3 target seems justified. Around 50% more pigs in 2030 than assumed in GAINS would result in a loss of around 5% points reduction potential. Accounting for the discrepancies in the poultry sector (inflated reduction potential by using high unabated NH3 EF in GAINS and a too ambitious control strategy for 'other poultry') would drop

[9] It should be noted that the Directive includes a specific provision that should prevent impacts on small farms (Annex III, part 2, section C)

reduction potential with another 6 to 8 % points. Thus a target in the region of -32% is deemed realistic and achievable.

2.14. Ireland

The analysis below provides the technical explanation for IE on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2030 WaM	2020	2030 COM/EP	2030 Council	**2030 New**
								-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2016)					Reduction commitments new NECD			
	kt	% reduction compared to 2005 national emission total								
SO_2	70.7	74.0	-66	-74	-81	-89	-65	-82	-85	**-85**
NO_X (*)	136.0	136.7	-43	-44	-61	-67	-49	-71	-69	**-69**
$PM_{2.5}$	10.8	19.4	-19	-25	-46	-46	-18	-39	-41	**-41**
VOC (*)	59.2	62.2	-25	-28	-34	-33	-25	-32	-32	**-32**
NH_3	110.7	110.0	-5	-4	+3	+3	-1	-10	-5	**-5**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

B. Analysis of proposed 2030 targets

1. SO_2

Proposed TSAP16 target of -82% could be supported but IE proposed a tighter target of -85% to compensate for a less stringent NH3 reduction target.

2. NO_X

Latest reported projections for NOx (LRTAP, 2016) show a reduction potential of -67% in the WaM scenario. Projections for road and off road in this scenario seem to be on the conservative (safe) side compared to the GAINS analysis.

Given that IE stayed very close to its TSAP16 ambition level in the GA (overall loss on PMeq reduction in GA agreement is minor), a target of -69% (2% points less than the cost-optimized TSAP16 target of -71%) is deemed realistic and achievable and can be supported by IE.

3. $PM_{2.5}$

Proposed TSAP16 target of -39% can be supported. IE proposed a tighter target of -41% to compensate for a less stringent NH3 reduction target.

4. VOC

Proposed cost-optimized TSAP16 target of -32% was retained for the general approach.

5. NH_3

At the bilateral between IE and COM in December 2015 IE presented a detailed analysis of the reduction potential on the NH3 emissions of its agricultural sector. It indicated that the TSAP16 target of -10% cannot be achieved, in particular because of the expected increase in dairy production as well as the significant expansion of the arable, pig, poultry and forestry sectors it envisaged under its Food Wise Sustainable Growth development plan. IE indicated that it was willing to accept a target of -3%. COM pointed to the additional available reduction potential in the non-agricultural sector (road transport) and pigs and poultry. Following the bilateral IE could support a target of -5%. Considering that IE is prepared - as compensation for the lower NH3 target - to do more on SO2 and PM2,5, keeping the overall proportional loss in PMeq reduction compared to the TSPA16 targets to a minimal, a NH3 target of -5% could be supported.

2.15. Italy

The analysis below provides the technical explanation for IT on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP	2030 Council	**2030 New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2015)				Reduction commitments new NECD			
	kt	% reduction compared to 2005 national emission total							
SO_2	406.5	407.3	-64	-68	-67	-35	-71	-71	**-71**
NO_X (*)	1188.1	1223.4	-35	-38	-58	-40	-68	-65	**-65**
$PM_{2.5}$	141.4	165.0	+2	-8	-15	-10	-54	-40	**-40**
VOC (*)	1165.4	1280.7	-29	-34	-37	-35	-49	-46	**-46**
NH_3	434.8	421.5	-5	-7	-8[10]	-5	-22	-14	**-16**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

After its consultations with IIASA in 2014, Italy identified much higher non-commercial biomass consumptions in households for historic and current years than previously known and used as a basis in the GAINS analysis. As a consequence official energy statistics and emission estimates have been adjusted accordingly and reported. Considering its strong impact on the overall reduction potential for $PM_{2.5}$, there was a need to revise (correct) the TSAP16 $PM_{2.5}$ target to a more realistic level. Consensus was found around -40%. Likewise there was also a need to revise the VOC target: given that the contribution of burning wood in households to the total VOC emissions in Italy is relatively small, the impact of the updated biomass use statistics for households on the VOC reduction potential is much less than on the $PM_{2.5}$ reduction potential: a VOC target of -46%, which is 3% points lower than the TSAP16 target of -49% was retained for the general approach.

B. Analysis of proposed 2030 targets

1. SO_2

Proposed cost-optimized TSAP16 target of -71% was retained for the general approach. Reduction achieved in 2014 according to reported emissions is -68%.

2. NO_X

The discrepancies between GAINS and the national views on NOx reduction potential mainly relate to the energy sector (power plants, stationary engines), industry (combustion, cement production), road and non-road (navigation). Considering that there might be slightly less reduction potential available for in particular the stationary engines (GAINS-OPT levels are below minimum MCPD ELVs), the cement industry (GAINS-OPT level is below upper BAT level) and maritime ((less) fleet renewal,

[10] in absence of national reported projections by IT the CLE GAINS projections are shown in table

combustion modification) than GAINS has identified, a target of -65% is deemed realistic and achievable and could be supported.

3. $PM_{2.5}$

After its consultations with IIASA in 2014 (WPE 2014), Italy identified much higher non-commercial biomass use in households for historic and current years than previously known. This has a strong impact on the projected use of biomass in 2030 and the overall reduction potential. In this new context IT finds the proposed target of -54% unrealistic and estimated a national reduction potential of -21% as feasible. Realizing that Italy's case is exceptional and a correction of the proposed target is justified, a sensitivity analysis was carried out for domestic wood combustion. On the basis of the outcome of this analysis and banking on additional reduction potential for the energy sector, refineries and waste, a compromise target of -40% was put forward and retained for the general approach.

4. VOC

The proposed target of -49% is considered by IT as not achievable because of the higher use of non-commercial biomass in households than previously estimated (see PM2,5). On the basis of a sensitivity analysis carried out for domestic wood combustion and banking on additional reduction potential for the refineries, off road and other, a reduction of -46% is considered reasonable and achievable. This target was retained for the general approach.

5. NH_3

There is a 10 percentage point gap between IT's estimated reduction (discussed during the bilaterals with COM in July-October 2015) and the TSAP16 reduction (-12% vs -22%). This different view on the NH3 reduction potential seemed to centre mainly around the use of inorganic fertilizers and the potential for substitution of urea based fertilizers. With respect to the use of inorganic fertilizers GAINS identified a decrease of around 45 kt between 2005 and 2030 (from 77 to 32 kt), resulting from an overall decrease in the use of inorganic fertilizer (-25 kt) and partial substitution of the urea based fertilizer (-20 kt): this decrease accounts for a 10% reduction cut in overall NH3 emissions. IT projects emissions from mineral fertilizer use to go down from 77 kt in 2005 to around 50 kt. The difference between IT's and GAINS projections (32 vs 50 kt) already explains almost half of the 10 % point gap between IT's estimated reduction and the TSAP16 reduction.

GAINS also identified reduction potential for the pigs, poultry and cattle farms and calculated a strong cut in NH3 emissions from passenger cars because of the fleet renewal (-14 kt, corresponding to 3% reduction points). IT sees in particular discrepancies for pigs and poultry. The reduction potential that GAINS identified for livestock mainly includes the cheaper measures like low nitrogen feeding, coverage of manure and low NH3 manure spreading and in addition the more expensive housing adaptation (total cost is around 600 EUR/ton). IT's emission projections for pigs and poultry on the other hand do not seem to imply the application of any additional measures after 2005.

IT has not shared detailed information on the basis it has used for its reduction potential of -12% besides indicating that its projections on animal numbers and total N applied for 2030 are similar to those used in the GAINS analysis. This would already mean that NH3 emissions from inorganic fertilizer would drop significantly because of the projected 40% lower use of inorganic fertilizer in

GAINS by 2030, accounting for around 6% points reduction. Although the assumptions on mineral fertilizer use are by no means more stringent than those made for other Member States in GAINS, IT expressed concerns about the costs involved with a strong substitution of urea based fertilizers. Reducing the substitution rates in GAINS from 50 to 20% would reduce the national NH3 reduction for IT in GAINS from -22% to -19%. An additional margin of 3% reduction points (around 13 kt) to avoid the implementation of the more expensive measures (housing adaption ...) for pigs and poultry farms would certainly suffice. A target of -16% is deemed realistic and achievable, and reasonable given that, in combination with the other targets (disregarding the necessary correction of the PM2.5 target), the overall proportional loss in PMeq reduction compared to the TSAP16 targets is low and corresponding to an EU ambition level of 49,6%.

2.16. Latvia

The analysis below provides the technical explanation for LV on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030	2030	**2030**
							COM/EP	Council	**New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2016)				Reduction commitments new NECD			
	kt		% reduction compared to 2005 national emission total						
SO_2	6.7	8.9	-56	-57	-46	-8	-42	-46	**-46**
NO_X (*)	41.1	42.0	-25	-25	-21	-32	-41	-34	**-34**
$PM_{2.5}$	29.7	22.5	-21	-21	-15	-16	-46	-43	**-43**
VOC (*)	55.7	56.4	-14	-15	-20	-27	-42	-38	**-38**
NH_3	14.9	16.5	+3	+6	+4	-1	-1 [+3]	-1	**-1**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

It can be noted that the emission reduction achieved in 2013 and 2014 for SO2 according to latest reported emissions (LRTAP submission 2016) is already steeper than the proposed TSAP16 target for SO_2.

B. Analysis of proposed 2030 targets

1. SO_2

Although the proposed TSAP16 target of -42% could be supported, LV proposed a tighter target of -46% to partially compensate for less stringent reduction targets for NOx and PM2,5. According to the latest reported emissions for the years 2013 and 2014, the current achieved reduction compared to 2005 is already higher than -50%.

2. NO_X

The main discrepancies in reduction potential between GAINS and LV relate to the energy sector, road transport and off road (railways).

Energy sector: LV foresees less electricity import and more generated electricity by LV. PRIMES/GAINS assumes that electricity import drops from 2 TWh in 2005 to 0,8 TWh in 2030. Assuming that import will drop to zero in 2030 (as indicated by LV) and the 0,8 TWh would be produced by a new gas turbine plant, it would only add 0,2 kt NOX. Assuming more coal produced electricity (as LV projects), the extra NOX would still be less than 1 kt and even less when banking on the new emerging BATAELs for LCP's. LV's projections / views for the energy sector seem therefore too conservative. Possible loss in overall reduction potential would be limited to 1% point.

Road transport: LV foresees 3 kt less reduction in road transport than GAINS: this projection was adjusted recently for reasons unclear. LV's previous reported projection for road (early 2015) was in

line with the GAINS projection. GAINS assumptions wrt fleet turnover by 2030 seem already rather moderate: 71% euro 6 gasoline cars, 80% euro 6 diesel cars, 75% euro 6 trucks.

Off road: GAINS assumes a drop in diesel activity in railway traffic due to electrification and switch to stage IIIb. LV disagrees with the projected electrification of railways by GAINS. The difference in views here would account for max. 2% points difference in reduction potential.

Accounting for the possible discrepancies in reduction potentials for the energy sector and rail, while also considering that additional reduction potential might be available (not yet banked on), like e.g. for industry (cement: 1kt), a target of -39% is deemed realistic and achievable.

Given that LV proposed a tighter SO2 target to compensate for less stringent targets for NOX and PM2.5, a NOX target of -34% as retained for the general approach would still limit the overall net loss of health impact reduction compared to the TSAP16 targets to an acceptable level.

Note that LV again revised its national projections for NOX in March 2016, lowering the projected reduction from -30% to -21%.

3. $PM_{2.5}$

According to the GAINS optimization 51% of the required PM2,5 reduction to reach the target will be delivered by activity changes (domestic combustion), 36% by CLE controls (domestic combustion, road) and 12% by additional control.

There was a good match between GAINS and LV's data for emissions and projections from road transport and domestic combustion, the two key sectors that together with a ban on field burning will be responsible for delivering most of the reductions. The most recent recalculations for 2005 that were reported (NECD, , LRTAP 2016) however show a strong downwards revision for the PM2.5 emissions from residential heating (NFR 1A4bi) (from 24,2 to 16,6 kt for the year 2005). This could have an impact on the overall reduction potential for LV since this sector is expected to deliver the largest part (80%) of the required reduction according to GAINS.

Significant discrepancies in reduction potential can be noted for the energy sector and industry, where LV's revised WaM projections provided September 2015 (projecting a national reduction of -29%) show emissions of these 2 sectors to increase between 2005 and 2030 with a factor2 to 3, while according to GAINS emissions of energy and industry combined decrease slightly by 2030. This discrepancy explains the gap between the reduction potential that LV considers realistic and the proposed TSAP16 target (-29% vs -46%).

LV foresees less electricity import and more generated electricity by LV (and more use of coal/biomass) (see NOX). Applying the dust ELVs for LCP and MCP's, an increase of even 20 PJ coal and 20 PJ use in PP would still result in less than 0,5 kt extra (LV expects emissions for the energy sector to go up from 0,65 kt in 2005 to around 3,5 kt, which is much too conservative).

For industry (combustion, process), LV expects emissions to increase from 1,36 kt in 2005 to 2,6 kt in 2030, while GAINS projects a decrease from 0,95 kt in 2005 to 0,61 kt in 2030. Emissions are linked to combustion processes, cement, secondary steel production and other. The projected increase is apparently linked to projected increase in biomass (LV = 16 PJ in 2030, GAINS = 11,5 PJ in 2030), but

again, proper application of available ELVs and BAT should not give rise to such increases. LV has most likely used default EF for developing its projections for industry that are too conservative and do not consider current legislation accurately.

Agricultural field burning. LV does not report emissions yet for this activity; adding it to the 2005 inventory and implementing a ban would deliver an additional 2,5% emission reduction vs 2005.

Reducing the proposed target with 3% points as was accepted for LV in the GA agreement seems reasonable and could be used to absorb (1) higher coal and biomass use in energy and industry that LV expects compared to the GAINS scenario, (2) a ban on field burning practices that is less effective than 100% and (3) recent revision of historic emissions for domestic combustion.

Proper application of the IED- and MCPD-ELVs and BAT should keep extra emissions to a minimum.

It should be noted that LV again revised its national projections for PM2,5 in March 2016, lowering its projected WM reduction potential to -15%: this is likely caused by the fact that this new PM2.5 projection is not aligned anymore with the recent revision of 2005 estimate for PM2.5

4. VOC

According to the GAINS optimization 13% of the required VOC reduction to reach the TSAP16 target will be delivered by activity changes (domestic combustion, road), 80% by CLE controls (domestic combustion, road and solvent use) and 7% by additional control (ban field burning).

Discrepancies between the GAINS analysis and the national views (latest reported projections/reduction potential: -42% vs -20%) were noted for solvent use, industry and to a lesser extent field burning.

Solvent use: there was good agreement between the GAINS 2005 estimates and the 2005 estimates reported by LV for solvent use activities in 2014. With the LRTAP submission early 2015 LV more than tripled its 2005 estimates for solvent use activities (from 16,66kt to 54,91kt). After the bilateral with COM LV revised its estimates for solvent use activities again (submission NECD, December 2015), bringing the national total for the base year 2005 again close to the GAINS national total for 2005 (around 55 kt). The GAINS main reductions are in coating applications, degreasing and printing, and no additional emission reductions beyond CLE are required. Relevant legislation is the Deco-paints Directive 2004/42/EC, the Industrial Emissions Directive (inclusion of former Solvent Directive 1999/13/EC), and BREFs. The BREF 'Surface Treatment using organic solvents' was adopted in 2007. According to its latest reported projections, LV appears to see much less reduction potential for the solvent use activities.

Industry: the national emission projection for 2030 is almost 10kt higher than GAINS. LV assumes more biomass use in 2030 (16 PJ vs 11,5 PJ in GAINS), but this would not account for the big difference. The main cause is likely LV's use of the default Tier 1 EMEP GB EF of 0,3kt/PJ in 2030, which seems easily a factor 5 to 10 too high. National projections seem rather conservative.

Field burning: emissions from field burning of agricultural wastes are omitted in LV's emission inventories. Adding these and enforcing a ban would deliver around 3% extra reduction points.

A VOC target of -38% was accepted for LV in the GA agreement. This drop of 4 % points compared to the TSAP16 target of -42% could be justified to account for part of the differences in views (activity levels, reduction potential) for industrial combustion and solvent use explained above.

5. NH_3

The stricter 2020 Gothenburg Protocol target of -1% was retained for the 2030 target in the general approach.

2.17. Lithuania

The analysis below provides the technical explanation for LT on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP	2030 Council	**2030 New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2015)				Reduction commitments new NECD			
	kt	% reduction compared to reported 2005 national emission total							
SO_2	41.4	31.6	-37	-44	-26	-55	-65	-60	**-60**
NO_X (*)	49.9	54.1	-16	-16	-52	-48	-51	-51	**-51**
$PM_{2.5}$	21.8	19.1	-4	-9	-35	-20	-48	-35	**-36**
VOC (*)	79.7	69.9	-16	-15	-53	-32	-47	-47	**-47**
NH_3	35.1	44.9	-9	-9	+6	-10	-10 [-2]	-10	**-10**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

B. Analysis of proposed 2030 targets

1. SO_2

Most of the discrepancy between national reported projections (LRTAP) and TSAP16 is related to the energy sector, where GAINS assumes a phase out of the use of heavy fuel oil in combination with a shift to more gas and a new nuclear plant, bringing the SO2 emission from PP down from 10 kt in 2005 to 1 kt in 2030. LT on the other hand projects a (rather high) increase of 10 kt to 14.5 kt. The difference of 13.5 kt accounts almost for the entire percentage points discrepancy in reduction potential. Taking into consideration sensitivity analysis on more biomass use in district heating, no nuclear power and the large discrepancy around base year emissions (revision of EI with submission 2015, in particular on domestic), a target of -60% as accepted for the general approach would give LT sufficient margin to account for possible different future evolutions. LT also suggested that the required SO2 reductions for the LT refinery are too demanding, but that would not take into consideration that the new BATc conclusions for refineries will define further reductions on refineries and that on average in the EU the SO2 levels in refineries will be much lower than the level that LT would need to go to.

2. NO_X

Proposed cost-optimized TSAP16 target of -51% was retained for the general approach.

3. $PM_{2.5}$

The TSAP16 reduction in 2030 is +13 percentage points compared with LT's national projections submitted to UNECE LRTAP in 2015 (-48% vs -35%). LT has different assumptions in particular on

agricultural waste burning (field burning), increased use of biomass in district heating, and the replacement rate for existing domestic stoves and boilers.

The national projections provided to UNECE LRTAP in 2015 included 1.96 kt PM2.5 for field burning while emissions for this activity were not included in LT's reported emission inventories. Omission of the 1.96 kt from LT's national projections would increase the national reported reduction from -35% to -45%. Similarly adding the 1.96 kt for field burning to the base year 2005 total and assuming a ban of this practice by 2030 would increase the reduction potential from -35% to -50%. On the other hand, higher use of biomass in district heating plants as assumed by LT could result in close to 1% point reduction loss.

The key sector for PM2.5 is domestic wood combustion (together with decrease in fossil solids in households). LT considers the rate of replacement of existing wood stoves and fireplaces in GAINS too optimistic. Although GAINS renewal rate does not appear too ambitious (overall leading to a decrease of around 25% in the average implied EF for wood combustion), a more moderate renewal rate would result in several percentage points less reduction. LT updated its national PM2.5 projections for domestic combustion (NFR 1A4) from 6 to 10 kt (communication to COM in July 2015). The GAINS OPT level for NFR 1A4 in 2030 is 8.33 kt. Adopting a position between these views (= allowing for 0.85 kt more emissions than in GAINS OPT) represents a relaxation of 4.5 % reduction points. In addition, assuming a 75% ban of field burning practices instead of the 100% ban in GAINS, to account for incidental firing and enforcement issues, would reduce the reduction potential by an additional 3% reduction points. A PM2.5 target of -40% should in this context be reasonable (allowing a margin of -0.5% for higher biomass use in district heating plants, -4.5% for slower replacement rate of domestic burning devices, and –3% for 75% ban of field burning of agricultural wastes). Note that the new eco-design standards for new domestic wood stoves and boilers will provide additional help in bringing $PM_{2.5}$ emissions from domestic combustion sufficiently down. LT cannot accept a PM2.5 target that is tighter than -36% (which is a target that would allow LT to take full account of the discrepancies between GAINS and national views on reduction potential). In combination with retaining the general approach targets for the other pollutants an increase of the PM2.5 target of -35% to -36% would constitute the minimal additional effort that is required from LT to stay on track towards an EU ambition of 49,6%.

4. VOC

Proposed cost-optimized TSAP16 target of -47% was retained for the general approach.

5. NH_3

The stricter 2020 Gothenburg Protocol target of -10% was retained for the 2030 target in the general approach.

2.18. Luxembourg

The analysis below provides the technical explanation for LU on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WaM	2020	2030 COM/EP -52.2%	2030 Council -48.3%	**2030 New -49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2016)				Reduction commitments new NECD			
	kt	% reduction compared to 2005 national emission total							
SO_2	2.6	2.4	-35	-35	-60	-34	-45	-45	**-50**
NO_X (*)	56.3	57.8	-46	-53	-77	-43	-85	-82	**-83**
$PM_{2.5}$	2.9	2.8	-32	-30	-42	-15	-43	-40	**-40**
VOC (*)	13.7	12.9	-27	-34	-39	-29	-49	-41	**-42**
NH_3	6.0	6.2	-3	-2	+8	-1	-24	-22	**-22**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

B. Analysis of proposed 2030 targets

1. SO_2

Proposed cost-optimized TSAP16 target of -45% was retained for the general approach. LU projects to reduce its SO2 emissions even by 60% in 2030. In view of this projection, LU is willing to increase its reduction obligation for SO2 and to accept a target of -50%, which would sufficiently compensate for in particular the weaker targets for NOX and PM2.5.

2. NO_X

More than 90% of the required reductions will be delivered in road transport. National projections for road match the GAINS projections; the reduction potential discrepancy is linked to different projections for energy and industry, mainly the result (according to LU) from a higher GDP (1,85 vs 3%) and population growth (from 0,461 M to 0,626 M vs 0,675 M) assumed by LU.

The proposed target of -85% seems in reach on the basis of GAINS's assumptions, with the caveat that GAINS has assumed an ambitious reduction on the cement production plant (from 1,75 to 0,35 kt/Mt produced), while it appears that the cement plant is already operating at the upper end of the BAT range (meaning less additional reduction potential available).

NOX from stationary industry in 2005 is mainly emitted by the iron and steel industry, cement, glass and ceramics. Emissions from industry went down from 4,4 kt in 2005 to 2,9 kt in 2013 because of i.a. implementation of SCR on one of the 2 glass plants, closure of ceramic production in 2010 and less use of NG in iron and steel industry. NOX emissions from I&S were already low by 2005 because of switch to EARC process before that date.

GAINS identified additional reduction potential for the NG use in I&S combustion plants (to a level of around 100 mg/Nm³). GAINS also identified additional reduction potential for the cement production plant, but this seems not (fully) available anymore (losing about 0,5 to 1% in reduction potential).

In general, there might be a small increase of NOX emissions from industry compared to reported levels in 2013/2014 because of higher activities in 2030 (e.g. cement), but not in the range that LU seems to expect. Proper application of IED and MCPD-ELVs and new BATc, e.g. on cement, glass, I&S, cement and LCP) should keep any increases to a minimum.

Further implementation of stage IV technology in industrial mobile machinery should provide somewhat more additional reduction potential for LU, even with an expected increase in activity.

Also for the energy sector, projections provided by LU seem on the conservative side. Worst case: the installation of a new gas-turbine plant of 350 MW operating 6000 hours would add less than 0,6 kt.

LU projects emissions of industry and energy sector together to increase to 6,56 kt in 2030, while GAINS projects a decrease to 1,64 kt in 2030 (difference being 5 kt). Considering less reduction potential for the cement plant and higher population and GDP growth by LU (leading to higher activities rates in 2030), an achievable, realistic cost-effective target is probably around -82% (the target accepted for the general approach). In light of recently reviewed projections in the fuel and transport sectors, LU proposed to increase its efforts on NOX and could support a target of -83%.

3. $PM_{2.5}$

According to GAINS almost all of the required reductions will be delivered in road transport (Euro 6 vehicles; PM control on exhaust). GAINS emissions for road transport are going down from 1,82 kt in 2005 to 0,50 kt in 2030, while LU' s projections provided to COM for discussion at the bilateral in November 2015 show only a decrease from 1,83 kt in 2005 to 0,9 kt in 2030. This difference accounts for a reduction discrepancy of 14% points (which largely explains the proposed target of-43% and LU's initial projection of -29%).

LU expects that further decreases of the PM2,5 exhaust emissions - because of the further penetration of euro 5/6 by 2030 - will be largely offset by larger traffic volumes. GAINS/PRIMES also considers growth in passenger and freight transport activity (respectively from 8,1 Gpkm in 2005 to 11,1 Gpkm in 2030 and 9,5 Gtkm in 2005 to 12,9 Gtkm in 2030: +1,3%/y), but less than the 3%/y used by LU (although this is for fuel used only, for neighbouring countries growth is less than 2%/y). More traffic would have a marginal impact on PM2,5 exhaust emissions, but would result in more PM2,5 emissions from road abrasions and component wear (as also projected by GAINS), but not to extent LU projected. Also LU expects less dieselification by 2030 than GAINS (61% versus 72%).

In addition GAINS also identified more reduction potential for the domestic sector (wood burning) where LU projected emissions to increase from 0,58 kt in 2005 to 0,7 kt in 2030 because of an increase in wood consumption (from 0,72 to 0,9 PJ). GAINS projects a doubling of wood consumption (from 0,66 to 1,28 PJ), while keeping the emissions at the 2005 level (because of renewal of stoves and boilers and use of cleaner technologies by 2030; after 2020: ED compliant). New information provided by LU after the bilateral confirmed this additional reduction potential for domestic wood combustion: revised projections for domestic combustion by LU show now a

decrease to 0,41 kt in 2030, making a target of -40% realistic. A higher population growth than currently foreseen in the projections should not necessarily have a big impact on PM2,5 domestic emissions if the consequential additional domestic fuel consumption is accommodated with the cleanest technologies and cleaner fuels like NG not emitting PM2,5. In addition LU's projections for road are perhaps on the safe side (see above). A target of -41% for PM2.5 should also be in reach for LU.

The revised 2030 projections provided by LU show PM2,5 emissions to go down to 1,7 kt: this projection was calibrated against a 2005 total of 2,83 kt and delivering as such -40% reduction (compared to the reported total for 2005 in 2015 (2,92 kt) it gives a reduction of -42%).

4. VOC

LU expects that additional reductions between 2013 and 2030 will be offset by higher traffic volumes and GDP/population growth than GAINS assumes. Compared to 2013 GAINS identifies in particular additional reduction potential for road (further penetration of ≥ euro 3), non-road (further penetration of stage IIIb and IV) and domestic (see explanations PM2,5; also confirmed by LU after bilateral). More diesel traffic will not lead to large offsets of this reduction potential, although a higher population increase (+45% instead of +35% compared to 2005) might have some impact on more (personal) solvent use, more than what is projected by GAINS.

Considering that any alternative future development in the road transport (being the key sector for VOC, as also for NOX and PM2,5) and higher GDP / population growth (in particular in respect to higher solvent use) might have a direct impact on the achievable reductions, a lower target of -40% to -43% should provide sufficient margin to capture these possible different future developments. Considering that Eurostat recently revised population projections for LU upwards (increase of 75% compared to 2005), a target of -42% is deemed realistic and achievable.

5. NH_3

Dairy cattle and beef cattle are responsible for more than half of the NH3 emissions in 2005. Emissions in GAINS for cattle go down, mainly as the result of a decrease in the number of cows by 2030. LU on the other hand expects an increase in dairy and beef cattle, making a target of -22% that LU can support, a challenge but it is deemed realistic and achievable although requiring additional reductions in the agricultural sector as identified in GAINS (for cattle, pigs and poultry and fertilizer use).

(Note that NH3 emissions were significantly recalculated for the submission 2016: in particular for mineral fertilizer use and dairy cattle)

2.19. Malta

The analysis below provides the technical explanation for MT on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030	2020	2030	2030	2030
							COM/EP	Council	**New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and 2030 GAINS CLE projections[11]				Reduction commitments new NECD			
	kt	% reduction compared to 2005 national emission total							
SO_2	11.4	11.4	-56	-59	-95	-77	-95	-95	**-95**
NO_X (*)	9.6	9.4	-48	-31	-79	-42	-79	-79	**-79**
$PM_{2.5}$	0.7	1.3	-43	-39	-72	-25	-76	-50	**-50**
VOC (*)	3.9	3.3	-10	-9	-26	-23	-27	-27	**-27**
NH_3	1.7	1.6	-1	-1	-8	-4	-24	-24	**-24**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

B. Analysis of proposed 2030 targets

1. SO_2

Proposed cost-optimized TSAP16 target of -95% was retained for the general approach.

2. NO_X

Proposed cost-optimized TSAP16 target of -79% was retained for the general approach. According to GAINS the required reductions will mainly be delivered by power plants (66%) and by road transport (32%).

Emissions in the electricity sector will drop with more than 90% due to (1) a switch from liquid to gas firing, (2) a doubling of the efficiency of the gross thermal power generation (e.g. because of switch from old liquid firing plants to new modern gas-turbine installations), (3) an increase of the renewable share (solar, wind, biomass) from zero % in 2005 to 23% in 2030 and (4) application of IED-ELVs / BATAELs. The assumptions on the phase out of liquid use in the power plant sector has not been disputed by Malta. It is the reason that Malta could also support the proposed SO2 reduction target of -95% (more than 90 % of SO2 emissions coming from burning liquid fuels in PP).

For road, the GAINS calculated reduction is already reached in 2013 (although contradicted by emissions reported for 2014 with the 2016 submission, which however seems to include some inconsistencies, see also PM2.5 analysis).

[11] in absence of national reported projections by MT the CLE GAINS projections are shown in table

Overall a target of -79% is deemed realistic and achievable (and in fact would not require any additional control measures above CLE), notwithstanding the recent increase in navigation/fishing activity and associated NOX emissions (between 2005 and 2013)

3. $PM_{2.5}$

According to GAINS 57% of the required reductions will be delivered in the energy sector (switch to gas, REN, see explanations NOX), 16% by road transport (fleet renewal), 21% by cement industry (high emission de-dusting) and 6% by field burning of agricultural wastes (banning).

There is a discrepancy of almost 50% for the 2005 estimates between GAINS and MT (0.71 kt versus 1.35 kt), mainly because MT estimates the PM2,5 emissions from HDV at 0,89 kt, while in GAINS this is set at 0,10 kt for 2005. This would seemingly provide MT more reduction potential for this source since exhaust emissions of trucks go down anyway with fleet renewal, but it appears that the figure of 0.89 kt might include the emissions for road abrasion and component wear that from the year 2010 onwards are reported separately at a level of around 0,43 kt (representing more than 50% of total PM2,5 emissions for 2013): this appears to be largely overestimated. In GAINS, emissions of road abrasion and component wear in 2030 are estimated at 0,03 kt. Furthermore, the latest emission inventories for PM2.5 submitted to UNECE LRTAP in February 2016 (time-series 2000 to 2014) show a number of inconsistencies that cannot be explained:

- road transport: PM2.5 emissions reported for heavy duty vehicles (HVD) gradually increase between 2005 and 2009 from 0.89 kt to 0.94, to suddenly drop to 0.11 kt in 2010 and then further decreasing to 0.06 kt by 2014. Simultaneously with the drop of 0.89 kt to 0.11 kt in 2010 for HDV, emissions for brake wear and road abrasion are reported which were not estimated prior to 2010: these emissions are estimated at 0.43 kt for the years 2010, 2011, 2012 and 2013 to suddenly go down to 0.05 kt for the year 2014.
- power plants (firing liquid fuels): reported PM2.5 emissions for power plants go down between 2005 and 2013 from 0.3 kt to 0.1 kt while jumping to 0.55 kt for the year 2014. This jump seems strange given that the activity level between 2013 and 2014 hardly changed (reported amount of liquid fired remains around 21-22 PJ). The reported PM2.5 estimate of 0.55 kt also doesn't match with the reported estimate for TSP for this sector (0.41 kt), which is lower than the estimate for PM2.5, a subset of TSP.

GAINS also identifies additional reduction potential for the cement industry, but when looking at the reported emission time-series for this activity, it appears that this reduction potential is already spent: this would reduce the proposed target of -76% with about 10 to 15% reduction points depending on the reference used (GAINS or MT).

Taking account of possible spent reduction potential for the cement industry and not banking on a full ban of field burning practices (75% instead of 100% ban, to account for incidental firing and enforcement issues) a target of -60% could be feasible. However, given the large uncertainties around the current reported PM2.5 estimates, in particular for the road non-exhaust emissions, and given that the lower PM2.5 target that was accepted for the general approach resulted in a relaxation of the PMeq reduction of around -7%, the general approach target of -50% can be supported.

4. VOC

Proposed cost-optimized TSAP16 target of -27% was retained for the general approach.

This target is close to the CLE reduction potential (-26%) and only 4 % reduction points beyond the 2020 GP target of -23%. According to GAINS around 70% of required reductions will be delivered by the road transport sector (less gasoline vehicles, renewal to euro 5/6 ...) and 18% by the power plant sector (see explanations for NOX: switch to gas / REN). Some reduction potential is also available in the solvent use activities (but partially offset by activity increases).

5. NH_3

Proposed cost-optimized TSAP16 target of -24% was retained for the general approach.

No information has been provided by MT that disputes the GAINS assumptions on activity projections and identified reduction potentials. Animal numbers used in GAINS for 2005 match reported animal numbers by MT. GAINS assumes moderate changes to livestock by 2030 (small decreases for beef cattle, pigs and poultry, doubling of number of sheep). Reduction potentials are mainly identified for pigs, poultry and dairy cattle farms and in a lesser extent for beef cattle and fertilizer use. A target of -24% is deemed realistic and achievable.

2.20. Netherlands

The analysis below provides the technical explanation for NL on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP	2030 Council	**2030 New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2016)				Reduction commitments new NECD			
	kt	% reduction compared to 2005 national emission total							
SO_2	64.5	64.1	-54	-55	-53	-28	-58	-58	**-53**
NO_X (*)	361.7	367.3	-30	-37	-57	-45	-61	-61	**-61**
$PM_{2.5}$	24.0	21.2	-37	-40	-49	-37	-40	-40	**-45**
VOC (*)	172.0	180.3	-18	-21	-16	-8	-22	-15	**-15**
NH_3	143.9	159.6	-18	-16	-23	-13	-21	-21	**-21**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

It can be noted that emission reductions achieved in 2013 and 2014 according to the latest reported emissions (LRTAP submission 2016) are already steeper than or close to the proposed TSAP16 targets for SO_2, $PM_{2.5}$, VOC and NH_3.

B. Analysis of proposed 2030 targets

1. SO_2

Proposed cost-optimized TSAP16 target of -58% was retained for the general approach. NL requested pollutant swapping between SO2 and PM2.5 to enable more coal firing in power plants than envisaged in the analysis. It could support compensating a lower SO2 target of -53% with a tighter target for PM2.5 of -45% (achieving the same health impact reduction).

2. NO_X

Proposed cost-optimized TSAP16 target of -61% was retained for the general approach.

3. $PM_{2.5}$

Proposed cost-optimized TSAP16 target of -40% was retained for the general approach. NL proposed a tighter PM2.5 target of -45% to compensate for a less stringent SO2 target. Reduction achieved according to latest emissions reported for 2014 is already around -40%.

4. VOC

The first counteroffer of -11% proposed by the NL to the PRES in Sep/Oct 2015 was in line with the GAINS national analysis (CLE) carried out for the NL, corresponding closely to the national CLE

projections of the NL. It can be noted that projections provided for certain sectors (solvent use, road, domestic combustion) in the national scenario seemed conservative.

The lower potential of -11% projected by NL is mainly linked to a higher use of domestic solvents (hairsprays, deodorants ...) assumed in 2030 (+ more than 50%, income related). In GAINS this increase is more moderate (+10%). NL has submitted updated VOC projections (Dec 2015, NECD, Feb LRTAP 2016) showing an increased reduction potential of around 15%. This is a reasonable and achievable target for the NL.

5. NH_3

Proposed cost-optimized TSAP16 target of -21% was retained for the general approach.

2.21. Poland

The analysis below provides the technical explanation for PL on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP	2030 Council	**2030 New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and 2030 GAINS CLE projections [12]				Reduction commitments new NECD			
	kt	% reduction compared to reported 2005 national emission total							
SO_2	1207.3	1246.4	-32	-36	-66	-59	-77	-69	**-70**
NO_X (*)	773.5	842.0	-9	-15	-49	-30	-51	-39	**-39**
$PM_{2.5}$	219.4	165.4	-13	-18	-11	-16	-46	-46	**-58**
VOC (*)	605.3	583.9	+5	+4	-34	-25	-55	-26	**-26**
NH_3	328.5	273.7	-1	-3	+1	-1	-22	-22	**-17**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

It should be noted that the targets for PM2.5 and SO2 as presented in document 10607/16 were adjusted after the COREPER meeting of 29 June 2016: the proposed SO2 target of -72% was weakened to -70%; to maintain the same health impact reduction the PM2.5 target was tightened from -54% to -58%. The much tighter target for PM2.5 that PL proposed (-58% vs -46% under TSAP16) sufficiently compensates for the less stringent targets on the other pollutants.

B. Analysis of proposed 2030 targets

1. SO_2

Some 90% of the SO2 in 2005 was emitted by power plants and domestic combustion (coal and lignite). GAINS calculated that 93% of the required reductions will be delivered by power plants and small combustion plants (households and commercial) (mainly PP), through less use of coal and lignite and more stringent controls (IED, MCPD). Even if maintaining current consumption levels of coal and lignite in power plants, the minimum ELVs of the IED-LCP and MCPD and the new and the more stringent BAT conclusions for LCP's that are in the pipeline would still make high reductions possible (estimated ≥ -74%) (IED and MCPD will also help in delivering reductions in industrial combustion). Reductions in domestic follow a switch from coal to low S coal and gas, biomass and REN. The use of less coal in households is also essential for improving air quality in certain areas in Poland.

Non-realization of the planned nuclear capacity will only have a limited negative impact on SO2 emissions. Even in the extreme case where the planned nuclear capacity is fully replaced by extra coal/lignite firing) reduction potential would at maximum drop with 2 to 3% points (as substantiated by separate sensitivity calculations). The new BATc for large combustion plants that are in the

[12] in absence of national reported projections by PL the CLE GAINS projections are shown in table

pipeline will provide sufficient support to keep the extra SO2 emissions from this extra lignite/coal firing well under control. A target of -72% should remain in reach. PL proposed an adjustment of the SO2 target from -72% to -70% (in exchange for a tighter PM2.5 target).

2. NO_X

Poland has not shared detailed information on its national analysis of the proposed targets, nor provided projections recently (to LRTAP). The margin on NOX provided in the GA agreement for PL seems rather large. A higher target is well in range on the basis of current legislation only (GAINS CLE = -49%).

According to GAINS, reductions for NOX will mainly have to be delivered in the energy sector (54%; activity changes, CLE control), road transport (30%; fleet renewal), non-road (14%; mainly tractors, renewal to stage IV) and industrial combustion. Even when less favourable assumptions / evolutions are taking into account than what GAINS has used for (inter alia) the energy sector (more use of solid fuels in 2030) and road (slower fleet renewal) the overall loss in reduction potential would not be more than 5% to 6% reduction points, in particular by banking on the proper implementation of the IED-LCP and MCPD and the new and the more stringent BAT conclusions for LCP's and other. Hence a target of -46% should be realistic and achievable. Nevertheless, in exchange for the tightening of the PM2.5 target, retaining the NOX target at -39% (general approach) can be supported.

3. $PM_{2.5}$

Proposed cost-optimized TSAP16 target of -46% was retained for the general approach.

Key sector for delivering the major part of the reductions according to GAINS is the domestic combustion sector.

PL proposed to tighten its target to -58% in exchange for weaker targets on the other pollutants. The target of -58% will provide the context by which PM2,5 emissions from households in PL can be brought down to contribute to the necessary improvements in air quality.

4. VOC

There are large discrepancies between Poland's latest VOC emission estimates for 2005 and the GAINS estimates for 2005 at sectoral level, complicating as such a proper assessment of the GAINS results for PL. The discrepancies in particular relate to the domestic combustion sector (one of the key contributors of VOC emissions in PL), where the GAINS 2005 estimate is considerably higher than Poland's estimate. As for PM2,5 the domestic combustion sector is key for the achievability of the proposed target (delivering more than 30% of the required reductions according to GAINS). The reason for this discrepancy is likely the result of differences in the EF used (reported activity data for 2005 being similar to the 2005 GAINS activity data): this difference accounts for around 5 percentage points of estimated reduction potential. Another sector where there are large discrepancies between reported emission estimates and the GAINS estimates is the 'solvent use' sector (reported emissions for 2005 are 30% higher).

Solvent use activities contribute largely to the VOC emissions in PL (around 1/3), making the available reduction potential from these activities quite sensitive towards different views in EF and activity

applied that result in different emission estimates for the different activities. Not more than 10% reduction margin should be allowed to account for the apparent discrepancies in solvent use activities between PL and GAINS.

GAINS has identified most reduction potential for VOC coming from road and non-road (together responsible for 45% of the required reduction). This reduction potential is the result of fleet renewal (euro 4-5-6, stage III-IV ...). Only banking on this reduction potential identified for road and non-road would already result in a national reduction of close to -26%, the target that was accepted for PL in the GA agreement. This target is only 1% point higher than the 2020 GP commitment of -25%.

Because of a lack of detailed national data on VOC (share of technologies, emission factors applied, projections etc.) that could further explain the apparent discrepancies with GAINS, it is difficult to propose a revised target on the basis of a technical analysis. Considering the above discrepancies / uncertainties with regard to domestic combustion and the solvent use activities an adjustment of the TSAP16 target by 15% points from -51% to -36% would seem acceptable to ensure an achievable target. Nevertheless, in exchange for the tightening of the PM2.5 target, retaining the VOC target at -26% (general approach) can be supported.

5. NH_3

Poland has in the past few years not submitted updated projections to UNECE (LRTAP) or the COM, nor has it provided the COM other information that could be used against the GAINS analysis.

According to GAINS large part of the NH3 reductions will be delivered by pig farms (a drop of 8% in the number of pigs and more control measures), activity changes in mineral fertilizer use and substitution of urea based fertilizer. Furthermore GAINS projects increases in beef cattle (+15%), milk production from dairy cattle (+12%) and poultry (+63%), to be compensated with emission control measures that GAINS identified mainly for dairy cattle and other poultry (broilers). Most measures that GAINS identified as cost-effective are the cheaper measures (low nitrogen feeding, low NH3 manure spreading and cover of manure storage). Total cost of the additional measures for the cattle, pigs and poultry farms is estimated at 19 M EUR (or around 390 EUR/ton NH3 reduced; EU average is 560 EUR/ton). Supporting funding for implementation is available through the CAP/Rural Development.

The proposed TSAP16 target of -22% was retained for the general approach, although in recent communications PL has questioned the achievability of this target. Because of a lack of detailed national data on NH3 that could further explain the apparent discrepancies with GAINS, there is no technical basis for proposing a revised target. However, given the tighter PM2.5 target that PL proposed, a lower NH3 target of -17% is deemed to be a reasonable alternative.

2.22. Portugal

The analysis below provides the technical explanation for PT on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP	2030 Council	**2030 New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2015)				Reduction commitments new NECD			
	kt	% reduction compared to reported 2005 national emission total							
SO_2	178.5	176.5	-78	-80	-78	-63	-83	-83	**-83**
NO_X (*)	245.6	255.8	-38	-38	-63	-36	-61	-61	**-63**
$PM_{2.5}$	59.2	57.1	-21	-22	-20	-15	-68	-51	**-53**
VOC (*)	223.5	212.0	-19	-21	-30	-18	-44	-38	**-38**
NH_3	54.1	50.3	+1	-2	-17	-7	-19	-14	**-15**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

B. Analysis of proposed 2030 targets

1. SO_2

Proposed cost-optimized TSAP16 target of -83% was retained for the general approach. According to the GAINS optimization 67% of the required reductions to reach the TSAP16 target will be delivered in the power plant sector (phase out of coal and heavy fuel oil) and 29% in industry (refineries and others). Mindful of latest reported SO_2 emissions, there is likely some additional reduction potential available in the pulp and paper industry (and refineries). It should be noted that the emission reduction achieved for SO2 in 2014 is already -80%, only 3% points away from the target of -83%.

2. NO_X

Proposed cost-optimized TSAP16 target of -61% was retained for the general approach. According to Portugal's reported projections NO_X emissions can be reduced with existing measures by 2030 to -63%. PT proposed a tighter target of -63% to compensate to some extent for a less stringent PM2.5 target.

3. $PM_{2.5}$

According to the GAINS analysis 43% of the required reductions to achieve the TSAP16 target of -68% will be delivered in the domestic wood sector (halving of biomass use, shift from fireplaces and stoves to boilers; strong renewal rates), 34% in industry (i.a. additional control in chemical industry), 13% by fleet renewal in road and non-road transport, 5% by banning field burning of agricultural waste and small scale waste burning and 3% in the energy sector (activity changes, additional measures). Portugal sees discrepancies with its national projections for domestic wood combustion

(maintaining biomass consumption at current levels, less replacement of fireplaces) and industry. Furthermore it questions the feasibility of a full ban of field burning by 2030.

PT has not provided a detailed analysis that could be compared against the GAINS analysis, making it difficult to assess the justification for its concerns. It can be noted however that GAINS assumes a strong turnover to 'improved' and 'new' domestic wood fireplaces, boilers and stoves (100% improved or new in 2030) and shift towards boilers, away from stoves and fireplaces. Furthermore GAINS assumes a strong drop in total domestic wood consumption (from 49 PJ in 2005 to 24 PJ). Current reported biomass use in households is around 30-35 PJ.

The IED-ELVs, MCPD-ELVs and the BATAELs should provide sufficient support to PT to enable the necessary action in industry, while a (partial) ban of field burning and small scale open burning in due time should also be realistic (alternatives exist and a ban is effectively in place in some countries). Key is therefore to accommodate the discrepancy in reduction potential for domestic wood combustion between PT and GAINS. A more moderate scenario for domestic wood combustion (CLE GAINS control strategy for PT and a slightly higher share of fireplaces, in combination with a higher biomass use as expected by PT) would reduce the optimized reduction potential of -68% to around -60%. An additional margin of 5% to account for the different views in reduction potential in industry and to allow still partial (25%) field burning of agricultural wastes in 2030, should provide enough comfort. Thus a target of -55% is deemed realistic and achievable. PT could support a tighter NOX target to compensate to some extent for a less stringent PM2.5 target of -53%.

4. VOC

According to the GAINS analysis most reductions will be delivered by domestic combustion (see explanations given for PM2.5), road transport and solvent use. The largest discrepancy between the GAINS projections (-44%) and the national projections (-31%) can be noticed for process industry (glass, chemical, food and drinks ...), where VOC emissions in GAINS stabilize between 2005 and 2030, but projections from PT show a strong increase (from 28 kt in 2005 to 45 kt in 2030). It is not clear what the cause is of this 50% increase in VOC emissions from process industry. This difference accounts for about 7 to 8 % reduction points. Other discrepancies can be noticed for domestic wood combustion (corresponding to 2% reduction points; see also explanations for PM2.5) and the fact that PT puts no ban on field burning in place (corresponding to 1% reduction point).

Overall, it seems feasible for PT to reduce its VOC emissions further down below its projection of 145 kt (-31%) to around -40%, the reduction that according to the GAINS analysis can be achieved on the basis of current legislation. A reduction target of -38% can be supported.

5. NH_3

National projections reported by PT to LRTAP in May 2015 show a reduction of -17% to -19% (depending on the base year reference: using submission 2014 or 2015). PT has brought its assumptions on reduction potential down to -14%, basically with the argument that it foresees growth in the agricultural sector (poultry sector) and that the base year emissions (2005) have been revised downwards in 2015, making the NH3 2005 total 10% different from the GAINS 2005 estimate (49 kt versus 54 kt). The previous reported total by PT for 2005 was 50 kt, so the overall downward revision was small. PT doesn't offer a detailed explanation of how the latest revision would impact

the available reduction potential, but notes that the projected emission total for 2030 is similar to the GAINS projection (42 kt vs 44 kt) and thus the reduction % is not aligned because of the different base year level. What can be noticed is that the revision brought a much better alignment for emissions from mineral fertilizer use (by adjusting the total activity downwards, resulting in much lower emissions, much closer now to the GAINS estimates) and that emissions from manure application have now been reported separately (apparently revised upwards). Worth noting in this context is that GAINS did not identify any measures for the use of mineral fertilizer for PT (no substitution of urea based fertilizer required). It should be noted also that with the LRTAP submission 2016 the NH3 emissions were slightly revised upwards again (for the base year 2005, from 49.2 to 50.3 kt; manly because of higher NH3 estimates for manure application): this has reduced the discrepancy with the GAINS estimates.

GAINS calculates about 3 kt reduction for the non-agricultural sources. This has not been fully considered in Portugal's national projections submitted to LRTAP in May 2015: in particular GAINS identified CLE control on fertilizer production, resulting in 1 kt reduction (or 2% points), not considered in PT's national projections. GAINS also identifies the banning of field burning of agricultural waste as a cost-effective measure, again not considered in PT's national projections: the banning of field burning is responsible for 1 to 2% reduction potential.

For the agricultural sector, GAINS mainly picks on the (cheaper) measures for pigs, cattle and poultry like LNF and LNA (low nitrogen feeding and low nitrogen application; and some housing adaption for pigs and poultry farms). GAINS also projects more livestock for beef cattle, pigs, sheep and poultry in 2030 than what PT reported in its national projections of May 2015 (a bit less on dairy cows, but the average milk yield per cow increases by 35% in GAINS). PT informed the PRES/COM in November 2015 that its national scenario now foresees a growth in agricultural sector, in particular the poultry sector. This is different from the reported activity projections to LRTAP in May 2015 where livestock and crop production decrease between 2010 and 2030, except for the poultry sector which remains at current level.

Given that GAINS also foresees a strong growth in the poultry sector (+50%) and that there is likely some reduction potential available for the non-agricultural sources (fertilizer production and field burning) which has not yet been considered by PT in its national projections, a target of at least -15% to -16% is deemed realistic and achievable.

2.23. Romania

The analysis below provides the technical explanation for RO on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP	2030 Council	**2030 New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2014)				Reduction commitments new NECD			
	kt	% reduction compared to reported 2005 national emission total							
SO_2	641.9	601.2	-66	-71	-84	-77	-92	-85	**-88**
NO_X (*)	309.0	316.0	-30	-31	-59	-45	-62	-57	**-60**
$PM_{2.5}$	145.3	114.5	+1	+1	-34	-28	-69	-39	**-58**
VOC (*)	394.0	298.8	-15	-16	-28	-25	-67	-43	**-45**
NH_3	185.8	204.4	-19	-21	-24	-13	-28	-22	**-25**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

It should be noted that the targets accepted for the general approach included significant weaker targets compared to the TSAP16 targets, in particular for PM2.5. These weaker targets would have a strong direct bearing on the overall EU health target: close to 20% of the overall drop in EU ambition level from 52% to 48% was caused by the substantially weaker targets accepted for Romania in the general approach. Also domestically the impact of these targets would be significant: they would result in 20% more premature deaths annually compared to what would be achieved with the TSAP16 targets.

On technical grounds there are ways to substantially limit the loss in health impact reduction. In particular the PM2.5 target would need to be tightened again to reach a health impact reduction that at EU level would correspond to 49,6%.

B. Analysis of proposed 2030 targets

1. SO_2

According to the TSAP16 analysis, more than 80% of the required reductions will be delivered by the power sector (activity changes, CLE controls), the remaining part mainly by industry (mix). RO predicts more use of solid fuels (lignite) by 2030 than GAINS, explaining most part of the discrepancy in reduction potential between GAINS and RO. Keeping the lignite consumption in PP for 2030 at current levels (base year 2005) (about 70% more than assumed in PRIMES/GAINS for 2030) and accounting for the fact that new BATc on LCP will be applicable before 2030, would not add more than 10 kt to the total for the PP sector (corresponding to a drop of around 2% points in reduction potential). Similarly for more industrial combustion of solid fuels. A target of ≥ -88% should be realistic (even with more lignite use than assumed in GAINS). Proper implementation of the IED-ELV and BATAELS and the new MCPD-ELVs will help in delivering the required reductions. Additional

lignite use (as projected by RO for 2030 and thus even more than current levels) would need to be compensated by applying stricter (the strictest available) control requirements (e.g. SO2 scrubbers with a performance efficiency of 98%).

2. NO_X

During the Commission bilaterals with RO, NOX was not discussed, as not being considered a key issue. Nevertheless RO's target for NOx in the GA is substantially weakened. However, the TSAP16 target of -62% seems realistic, supported by the latest 'CLE' projections that RO reported to LRTAP already showing a reduction potential of -59%.

According to GAINS, reductions will mainly be delivered in road and non-road (fleet turnover; euro standards, stage IV, ...), the energy sector (decreased use of lignite and HFO in PP; IED) and industry (cement, glass, combustion: IED,BAT, MCPD,...). The main discrepancies in reduction potentials between GAINS and RO can be noticed for the energy sector (PP) and the domestic/commercial sector (incl. mobile). In particular the future application of the new BATAELs for LCPs should deliver sufficient additional support to enable further reduction measures in the energy sector - (in case the future development in the energy sector would be somewhat different from the GAINS/PRIMES scenario) - that would allow to preserve the achievability of the proposed target of -62%. An additional margin of 2% points that brings the proposed target to 60% should certainly suffice.

3. $PM_{2.5}$

RO's GA target of -39% aligns with the reduction that according to GAINS can be achieved with current legislation (CLE baseline).

According to the GAINS analysis, 56% of the required reductions to achieve the TSAP16 target of -69% will be delivered by changes and controls in domestic combustion and 23% by banning field burning of agricultural wastes. This makes these two activities key in achieving any meaningful PM2.5 reduction for RO. CLE/additional controls in industry will be further responsible for 12% of the required reduction. Contributions of other sectors (energy sector, road and non-road) to reducing PM2.5 emissions are relatively small.

There is a considerable divergence between GAINS 2005 emission total and reported total (20-25% difference), mainly due to the omission of PM2.5 emissions from field burning of agricultural wastes in RO's emission inventory. There is sufficient satellite evidence showing that field burning is still a widespread practice in Romania. Including historic emissions from field burning to the emission inventory and assuming a ban by 2030 would increase RO's national projected reduction potential from -39% to -49%. Banning make sense and has been shown possible in other MS. For domestic combustion (residential, commercial, other) GAINS assumes that PM2.5 emissions can be reduced cost-effectively from 83 kt in 2005 to 26 kt in 2030. RO projects that emissions for this sector can be reduced from 86 kt to around 50 - 55 kt, or roughly 25 -30 kt less, which would correspond in the GAINS analysis with 20% points less reduction. Most of the PM2.5 emissions from domestic combustion in RO are linked to wood combustion in households (≥95%) and mainly from stoves.

The main GAINS assumptions for wood combustion in households are:

- Overall wood combustion remains constant at around 114-115 PJ between 2005 and 2030. Reported wood combustion in households in RO already increased from 114 PJ in 2005 to 131 PJ in 2014.
- The structure of appliances changes slightly over 2005 to 2030: 98% stoves, 2% boilers, 0% fireplaces in 2005 going to 83% stoves, 15% boilers, 2% fireplaces in 2030. There is a moderate shift from stoves to boilers (manual and automatic) and fireplaces.
- Stoves are assumed to go from 95% 'no-control' and 5% 'improved' in 2005 to 80% 'improved' and 20% 'new' in 2030. Manual boilers go from 94% 'no-control', 5% 'improved' and 1% 'new' in 2005 to 85% 'improved' and 15% 'new' in 2030. ('improved' is what is on the market now; 'new' is appliances that (after 2020) should be compliant with the new Eco-design requirements). The turnover rate of stoves is considered as too optimistic by RO (assuming in particular slower turnover in countryside).
- Although GAINS assumes a high turnover (replacement rate) from uncontrolled existing to improved/new stoves by 2030 (from 95% uncontrolled in 2005 to 100% improved/new), there is a conservative assumption in the EF used for these stoves, being higher than the Eco-design-compliant EF for new stoves (The GAINS EF for improved and new stoves for 'total PM' correspond to about respectively 450 and 250 mg/Nm³ at 13% O2: this is much higher than the new approved PM standard of 40 mg/Nm³ at 13% O2 under the ED for new stoves; the real life PM2.5 emission factor for wood burning stoves that corresponds with the new eco-design standards for stoves would be around 110 mg/Nm³ or 75 g/GJ).

Applying a control strategy (turnover rate) for domestic wood stoves close to CLE (with 20% of the stoves remaining uncontrolled in 2030) would result in a reduction loss of about 6% points.

Applying a 75% ban on field burning (instead of 100%, i.e. a full ban) to account for incidental fires and enforcement issues would further reduce the reduction potential in the GAINS analysis by 4% points.

Additional emissions from a higher biomass consumption in the domestic sector than GAINS assumes could be offset with a further move from stoves to cleaner (automatic) boilers or other compensating measures and/or applying the EF for the new appliances installed after 2020 that comply with the new eco-design standards (GAINS EF apparently being conservative).

Besides field burning and domestic wood combustion there are some relatively smaller discrepancies between GAINS and national views in emissions, projections and reduction potentials from other sectors (energy, industry, road, non-road, small scale open burning). The overall discrepancy is limited to a few percentage points: proper implementation of the IED- ELVs and BATAELs, MPCD-ELVs and shifts in fuel choices should help to (largely) cover this discrepancy.

From the above analysis it seems that a target of -58% (compared to -69% as proposed by the Commission by incorporating an allowance of – 6% for domestic combustion, – 4% for agricultural field burning and -1% for remaining smaller discrepancies) is deemed realistic and achievable.

4. VOC

The GAINS 2005 emission total is around +95kt compared with RO's latest reported total for 2005, and the TSAP16 reduction potential in 2030 is more than double RO's projected potential.

The 95kt discrepancy for the base year is the result of a combination of several sectoral discrepancies (sum of negative and positive differences), but mainly relate to lower estimates for domestic combustion and solvent use and the omission of VOC emissions from field burning in RO's emission inventory.

Including historic emissions from field burning to the emission inventory and assuming a full ban by 2030, would add an extra 6% of reduction potential vs 2005.

The remaining discrepancy is due to significant differences between GAINS and national projections for domestic combustion, solvent use, fugitive emissions (refineries, oil distribution) and to a lesser extent road transport. The assumptions for the latter three concern activity changes and implementation of existing legislation. For domestic combustion, the different assumptions in control strategy and applied (unabated) emission factors account for the differences (RO finds GAINS too optimistic: see PM2,5 explanations).

Applying the national (lower) EF for wood burning in residential stoves and a 'less ambitious' control strategy for domestic combustion (close to CLE) would result in about 10% points reduction loss. Not banking on a full ban of field burning practices (75% instead of 100% ban, to account for incidental firing and difficulties to fully enforce a 100% ban) would reduce the reduction potential with 2 % points. Furthermore allowing additional margin to account for uncertainties in the solvent use activities, fugitive emissions and road transport (different 2005 estimates, different views on reduction potential), would bring a realistic and achievable target close to -45% (67% -10% domestic combustion -2% field burning -10% other), a target that RO could support.

5. NH_3

Emission reduction achieved in 2013/2014 is around -20%. Most recent reported projections (2014) showed a (CLE) reduction potential of -22%/-24% (depending on version of 2005 estimate). A national reduction of -22% was accepted as target for RO in the GA.

The national projections reported by RO in 2014 are based on higher animal numbers in 2030 than GAINS (in particular for dairy cows, pigs and poultry). Adding NH3 emissions from field burning to the emission inventories and reducing that activity by 75% by 2030 would deliver 1 to 2 % extra reduction.

Considering in addition that

- RO projects NH3 emissions from mineral fertilizer to increase from 4-5 kt in 2005 to more than 35 kt in 2030.
- this strong increase is likely linked to an increased use of urea base fertilizer
- GAINS considers a similar increase of NH3 emissions from fertilizer use in the baseline, but that 90% substitution of urea based fertilizer or alternative measures would deliver a reduction of

about 20 kt compared to the 2030 CLE level; that even a very moderate substitution rate of 20% would already deliver an extra 2% reduction points

- it can be expected that RO's higher projections on livestock would result in overall lower use of mineral fertilizer than now projected (similar estimate now as in GAINS, but in GAINS with less livestock); because more manure will be produced with more livestock,

a target of at least -25% is deemed realistic and achievable.

2.24. Slovakia

The analysis below provides the technical explanation for SK on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2030 WaM	2020	2030 COM/EP	2030 Council	**2030 New**
								-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2015)					Reduction commitments new NECD			
	kt	% reduction compared to 2005 national emission total								
SO_2	89.9	89.0	-40	-49	-78	-79	-57	-82	-82	**-82**
NO_X (*)	91.3	102.3	-22	-20	-35	-34	-36	-48	-48	**-50**
$PM_{2.5}$	34.7	39.1	-19	-22	-11	-29	-36	-63	-40	**-49**
VOC (*)	70.9	107.5	--19	-20	-27	-27	-18	-32	-32	**-32**
NH_3	28.8	43.4	--14	-15	-14	-35	-15	-43	-30	**-30**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

Note that the EU general approach (for the 28 MS) results for SK in 17% more premature deaths compared to the original proposal. Around half of this increase is caused by SK's weaker targets for $PM_{2.5}$, NH_3, and the other half by weaker targets for i.a. PL, RO and HU.

B. Analysis of proposed 2030 targets

1. SO_2

Proposed cost-optimized TSAP16 target of -82% was retained for the general approach.

2. NO_X

Proposed cost-optimized TSAP16 target of -48% was retained for the general approach. SK could support a tighter target of -50% to compensate for a less stringent PM2.5 reduction target.

3. $PM_{2.5}$

According to the GAINS analysis 46% of the required reduction to achieve the TSAP16 target of -63% will be delivered in domestic combustion. The large discrepancy in national reduction potential between GAINS and SK's most recent national views (-63% vs -40%) mainly relates to domestic wood combustion (being also the main source of PM2,5 emissions in SK). GAINS assumes a 13% increase in activity between 20025 and 2030, from 21.4 to 22.9 PJ. SK did not provide activity projections so it wasn't possible to determine to what extent activity assumptions are playing a role.

The main GAINS assumptions are:

- The structure of appliances remains broadly constant over 2005 to 2030 (slight increase in share of stoves): 80% stoves, 15% boilers, 5% fireplaces in 2005 going to 84% stoves, 12%

boilers, 4% fireplaces in 2030 . Thus most of the combustion is assumed to be in stoves (which have higher specific emissions than boilers).

- No controls are assumed for fireplaces. Stoves are assumed to go from 95% 'no-control' and 5% 'improved' in 2005 to 3% no-control and '97% improved' in 2030. Manual boilers go from 95% 'no-control' and 5% 'improved' in 2005 to 96% 'improved' and 4% 'new' in 2030. ('improved' is what is on the market now; 'new' is appliances that (after 2020) should be compliant with the new Eco-design requirements)
- Although GAINS assumes a high turnover to improved stoves by 2030 (to 97%), there is a conservative assumption in the EF used for these stoves, being much higher than the Eco-design-compliant EF for new stoves. (The GAINS EF for improved stoves is 299 g/GJ for PM2.5 and 321 g/GJ for 'total PM' corresponding to 480 mg/Nm³ at 13% O2: this is more than a factor 10 higher than the new approved PM standard of 40 mg/Nm³ at 13% O2 under the ED for new stoves; the real life PM2.5 emission factor for wood burning stoves that corresponds with the new eco-design standards for stoves would be around 110 mg/Nm³ or 75 g/GJ.)

The discrepancy with SK's projections on domestic combustion is likely a combination of applying different activity projections, different renewal rates and different emission factors. A more moderate stock turnover than what GAINS assumes, for example maintaining 1/3 of the stoves and boilers uncontrolled by 2030, in combination with applying more stringent EF for stoves and boilers installed after 2020 that comply with the new Eco-design standards (so stricter EF than the GAINS EF assumed for 'improved': i.e. assuming that the controlled stoves are 1/3 'improved' and 1/3 'new'), would result in a loss of reduction potential of around 7.5 to 9.5 % points. Additional reduction potential is available to recover some of this loss, e.g. by enabling a shift from stoves towards boilers. Maintaining the current shares of stoves and boilers up to 2030 would already reduce the loss by 1% point.

Contrary to GAINS, SK has so far not estimated and included emissions from field burning of agricultural wastes and open burning of wastes to its emission inventories. GAINS assumes a 100% ban of field burning and small scale open burning which delivers a reduction of around 2.3% points. Assuming a 75% ban (to account for possible incidental fires and enforcement issues), would result in a loss of overall reduction potential of around 0.5% in GAINS.

In addition to the cost-effective reductions that GAINS identified for domestic combustion, a large part of the reductions (39%) will according to GAINS also be delivered in the energy sector (decrease of lignite and coal use in power plants, IED-control). The GAINS projection for the energy sector matches with the national projections that SK provided for this sector. The contributions from other activities (industry, road and non-road) in reducing emissions are according to GAINS less relevant, although some small discrepancies with national views can be noted also for these. A margin of 1% should suffice.

Considering the above, a target in the range of -52% to -55% is deemed realistic and achievable. SK could support a tighter NOX target of -50% to (partially) compensate for a less stringent PM2.5 target of -49%.

4. VOC

Proposed cost-optimized TSAP16 target of -32% was retained for the general approach.

5. NH_3

Key in explaining the reduction potential discrepancy between SK and GAINS (-25% WeM (updated) and -35% WaM versus -43%) relates to the assumptions for pigs and mineral fertilizer use (and to a lesser extent, poultry). There is also a clear discrepancy between SK's and GAINS projections with respect to the projected number of dairy and beef cows, but based on more recent information SK has adjusted these projections (assuming less decrease), bringing the national projected numbers now closer to the GAINS projected numbers. Latest assumptions and projections for dairy and beef cattle now match fairly well. Remaining discrepancies between the target of -30% that was accepted for the general approach and the GAINS potential of -43% seem to relate specifically to pig sector and mineral fertilizer use.

For pigs the issue is mainly activity. SK assumes in its projections 5 times more pigs in 2030 than GAINS. This increase seems unrealistic given the overall decreasing EU trend. More recent information from SK seems to suggest a lower increase in pigs than previously projected. Limiting the increase to 1,5 M pigs in 2030 (still 3 times the GAINS projection) would deliver an extra 5% point reduction in SK's national scenario.

For poultry GAINS identified additional reduction potential beyond what SK currently assumes. SK argued that many measures that GAINS identified as cost-effective are already implemented in SK. This does however not really show in the EF used by SK for the base year.

Regarding the use of mineral fertilizers, GAINS assumes an increase in use of 35% between 2005 and 2030 and a 90% substitution of urea based fertilizers, resulting in an emission drop of 33%. The high substitution rate of urea based fertilizers delivers up to 5% reduction points compared to the 2005 level according to GAINS. SK projects an increase of emissions of this activity, likely the result of assuming much less / no substitution of urea based fertilizers. It is fair to assume here that with the higher pig production as projected by SK there would less supplementary need for mineral fertilizer (given that more manure would be produced and spread). Note that besides substitution other measures exist to minimize ammonia emissions from urea fertilizers (e.g. quick incorporation of urea into the soil, injection of urea into the soil, use of urease inhibitors and irrigation of the field after urea application ...).

The new NH3 emission inventories that were submitted in 2016 show a strong upwards revision of historic NH3 emissions: the 2005 NH3 total was revised from 28.6 kt (submission 2015) to 43.4 kt (submission 2016): emissions from manure management (livestock) and mineral fertilizer use were revised upwards and NH3 emissions from stationary combustion in the agricultural, fishing and forestry sector (NFR 1A4ci) , not estimated before, were added. The new emission estimates that were added for NFR 1A4ci are significant (6.9 kt in 2005, dropping to 3.7 kt in 2014). The latest version of informative inventory report submitted on the 9th of May 2016 has not provided any details yet regarding these new NH3 emission estimates for NFR 1A4ci.

The latest revision of the NH3 emission inventory (submission 2016) has resulted in significant changes of the NH3 estimates of certain activities, leading now to discrepancies between the reported 2005 NH3 estimates and the GAINS 2005 estimates. This complicates a proper analysis of the available reduction potential vis-à-vis the GAINS analysis.

Considering that the impact of the latest revision of the NH3 emission inventory on the available reduction potential is at the moment unclear (although likely not negative), the GA target of -30% is still deemed realistic and achievable. Although it is likely that there is additional reduction potential available (i.a. from measures to minimize NH3 emissions from urea based fertilizers: substitution, quick incorporation ...), given this new situation, it is acceptable to retain the general approach target of -30%.

2.25. Slovenia

The analysis below provides the technical explanation for SI on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2030 WaM	2020	2030 COM/EP	2030 Council	**2030 New**
								-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2015)					Reduction commitments new NECD			
	kt	% reduction compared to 2005 national emission total								
SO_2	39.4	41.0	-72	-78	-92	-92	-63	-88	-91	**-92**
NO_X (*)	49.7	50.1	-15	-24	-61	-63	-39	-65	-65	**-65**
$PM_{2.5}$	14.7	13.3	+6	-7	-47	-47	-25	-76	-58	**-60**
VOC (*)	44.7	40.8	-31	-36	-37	-39	-23	-59	-53	**-53**
NH_3	18.8	20.9	-8	-8	-11	-12	-1	-26	-15	**-15**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

Other options than proposed in table above can achieve the same health impact reduction: e.g. a slightly tighter target for SO_2 in line with the reduction potential that SI has projected (-92%) would allow a target of -62% instead of -63% on $PM_{2.5}$ or allow to keep the NH3 target at the GA target of -15%.

B. Analysis of proposed 2030 targets

1. SO_2

SI proposed a target of -92% (4% tighter than the proposed TSAP16 target of -88%) to compensate for less stringent reduction targets for PM2,5 and NH3. According to SI's latest reported projections (2015) a reduction of -92% is deemed achievable by 2030.

2. NO_X

Proposed cost-optimized TSAP16 target of -65% was retained for the general approach. The lower targets for PM2,5 and NH3 agreed to in the General Approach for SI resulted in a substantial loss in ambition. To allow its concerns on these pollutants to be accommodated, SI is willing to accept the proposed TSAP16 target of -65% for NOX, which is just one percent above the GAINS CLE (-64%). According to the latest projections that SI reported to LRTAP (2015), the proposed target of -65% is in reach. According to GAINS, reductions will mainly be delivered in road and non-road (fleet turn over), the energy sector (decreased use of lignite and coal in PP) and industry (combustion). The reduction potential available in the industrial combustion sector has seemingly not been fully considered in SI's national projections. Proper application of the IED-ELVs, new MCPD-ELVs, new emerging BATAELs for LCP's, NRMMD (stage IV for mobile machinery) ... should be able to deliver 1 or 2 extra kt for SI (corresponding to 2 to 4% reduction points).

3. $PM_{2.5}$

Key sector of PM2,5 emissions in SI is domestic combustion (wood use), responsible for around 60% of total PM2,5 emissions (2005).

The main discrepancy in reduction potential between GAINS and the national projections (-76% vs -47%) relates to different assumptions for domestic wood combustion. SI assumes a higher proportion of stoves vs boilers and a slower replacement to new and cleaner devices (Gains assumes a full switch away from the 'no control' boilers to 'automatic', 'new' and 'pellet' boilers).

SI's concerns on domestic wood combustion have been reflected in the analysis by retaining a higher share of stoves than in GAINS (around 15%), as well as a slower renewal rate (keeping the no control share at around 10 to 20% in 2030). This would result in 10 % to 16 points fewer reduction (from -76% to a target in the range of -60 % to -66%).

Note also that GAINS assumes a strong increase in domestic wood consumption between 2005 and 2030 (+44%) which SI in its reported projections does not foresee (stable consumption). This would deliver additional margin that SI could use to reduce its emissions of domestic wood combustion appropriately. Note that the emission factors used for SI in GAINS for the no control, improved and new stoves and boilers are comparable. The main difference is the degree of control assumed for 2005 in GAINS.

Thus while SI's concerns merit some adjustment to the reduction target for PM2,5, they do not justify a relaxation to the full extent allowed in the GA. Moreover, given that SI is currently in non-compliance with the PM10 limit value of Directive 2008/50/EC for 4 out of 6 zones, it is not clear how its projected PM2.5 emissions from the domestic sector would be consistent with resolving this non-compliance problem. For instance the strong projected increase in the share of stoves by 2030 compared to its current share (from 20% to 31%), apparently at the expense of (cleaner) manual boilers, will not help to solve SI's non-compliance problem. Latest information shared by SI indicated that the share of stoves has been reassessed and is now estimated to be lower (at around 16% for the year 2015) and that it foresees that this lower share will more or less remain constant till 2030. This fact may also help to further tighten the PM2.5 target compared to what was accepted for the general approach.

Some other - smaller - discrepancies in reduction potential exist for the energy sector and industry, mainly due to different views on the emission factors used for the Al production and brown coal firing in power plants, which are probably overestimated in GAINS. In addition note also that SI does not report PM2,5 emissions from field burning of agricultural wastes and hence does not take the reduction potential of banning field burning practices into account in its national projections and reduction potential. GAINS assumes a full ban of field burning by 2030. If instead of a full 100% ban a 75% ban would be applied (to account for incidental fires and difficulties to enforce a full ban) and correcting for the discrepancies in base year estimates for brown coal firing and AL production, the cost-effective reduction potential identified by GAINS would drop by around a further 3 percentage points.

Thus combining the adjustments to accommodate SI's domestic combustion concerns, and for agricultural field burning, a target in the range of -57% to -63% is deemed realistic and achievable. A

target of -60% (halfway this range) could be supported by SI. Together with the changes on the other targets it would keep SI on track towards an EU ambition of 49,6%.

4. VOC

As for PM2,5 the key sector of VOC emissions in SI is domestic combustion (wood use). Also for VOC there is large discrepancy in reduction potential with the national projections for domestic wood combustion (see explanations for PM2,5: different assumptions on shares stoves/boilers and replacement rates). In addition SI assumes much lower EF for the no controlled stoves and boilers than GAINS, reducing significantly the available reduction potential compared to the GAINS estimates (about 5% points). Some additional margin of a few % reduction points to address the less optimistic expectations for the domestic sector should provide SI some comfort in achieving the required reductions here (see also PM2,5).

Note also that SI does not report VOC emissions from field burning of agricultural wastes. Including the historic emissions from field burning would add 0,64 kt to the 2005 emissions and assuming these are abated in 2030, there would be an extra 2% of reduction potential vs 2005. A target of -53% is deemed realistic and achievable.

5. NH_3

There is an overall good match between GAINS and SI's estimates for 2005, except that SI updated its NH3 emissions from mineral fertilizer use in its 2015 submission, using the EF of the EMEP GB 2013 edition. This update should have a slight positive impact on the available reduction potential for mineral fertilizer use compared to the GAINS calculations. GAINS assumes 30% less mineral fertilizer use by 2030 and a substitution of 75% of urea based fertilizers (the share of urea based fertilizer is already low). This seems realistic, in particular in the national context where SI projects an increase in livestock and production of manure and hence less need for supplementary mineral fertilizers. Note in this context that besides substitution also other measures exist to minimize ammonia emissions from urea fertilizers (e.g. quick incorporation of urea into the soil, injection of urea into the soil, use of urease inhibitors and irrigation of the field after urea application ...).

The GAINS optimization mainly picks on the cheaper measures for livestock farms (pigs, poultry, cattle), with a 'reasonable' total additional cost of around 1,8 M EUR or 640 EUR/ton NH3 reduced.

Applying SI's projected animal numbers for 2030 (5 to 20% more pigs, poultry and cattle) would reduce the overall reduction potential by about 4%.

SI also questions the applicability of some of the measures identified as cost-effective by GAINS, because of certain geographical and socio-economic conditions (small farms[13]), also arguing that some of them have already been implemented (e.g. use of low protein ratios) and believing that the potential of some of the measures is overestimated (e.g. low emission stables for other poultry). It is difficult to judge the justification of these claims. A further margin of 4 % reduction points (an extra 0.75 kt) would largely accommodate these apparent discrepancies (see also national projections that

[13] It should be noted that the Directive includes a specific provision that should prevent impacts on small farms (Annex III, part 2, section C)

SI reported to UNECE LRTAP). The considerable share of animals on smaller farms in SI is considered in the GAINS applicability rates.

Thus combining the adjustments to accommodate SI's projected animal numbers for 2030 and concerns on applicability and reduction potential, a target of -18% is deemed realistic and achievable. Considering that SI proposed to further tighten its SO2 target of -91% (accepted for the general approach) to -92%, the general approach target of -15% for NH3 should be acceptable: this swapping would achieve the same health impact reduction.

2.26. Spain

The analysis below provides the technical explanation for ES on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP	2030 Council	**2030 New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2015)				Reduction commitments new NECD			
	kt	% reduction compared to reported 2005 national emission total							
SO_2	1245.3	1254.8	-81	-81	-68	-67	-87	-87	**-88**
NO_X (*)	1365.8	1310.3	-43	-44	-28	-41	-66	-62	**-62**
$PM_{2.5}$	144.4	94.7	-28	-30	-12	-15	-62	-50	**-50**
VOC (*)	870.7	806.6	-27	-27	-27	-22	-39	-39	**-39**
NH_3	377.0	382.7	-6	-3	+2	-3	-21	-16	**-16**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

B. Analysis of proposed 2030 targets

1. SO_2

Proposed cost-optimized TSAP16 target of -87% was retained for the general approach. The emission reduction achieved in 2013-2014 compared to 2005 is already at -81%, mainly accomplished in the energy sector (PP) as a result of reduced use of liquid and solid fuels (coal, lignite). This is in line with the GAINS analysis that shows that the achievability of the proposed target of -87% will mainly depend on whether the assumed activity changes in the baseline (reduced use of coal, lignite ...) will fully materialize (in particular in PP and industry, the two key sectors responsible for most of the required SO2 emission reductions). Tightening the SO2 target with 1 extra percentage point above the TSAP16 target of -87% would allow to keep the PM2.5 target at -50% (instead of -54%), the level that was accepted for the general approach. An extra reduction of 12 kt SO2 (which corresponds to 1 extra percentage point) seems a plausible option: e.g. (i) by further reducing the use of S containing fuels (coal, lignite and heavy fuel oil) in the energy sector (power plants) or (ii) by applying the proposed - soon to be adopted - BAT conclusions for large coal (and lignite) firing plants and applying the new ELVs from the MCP Directive to diesel engines (mainland). On the latter it appears that the GAINS SO2 emission factors assumed in the optimized scenario for coal firing power plants and diesel engines on heavy fuel oil are significantly higher than respectively the new proposed BAT conclusions and the ELVs from the recently adopted MCP directive, making up in total for a difference of around 12 kt.

2. NO_X

No change is proposed. According to GAINS around 50% of the reductions will be delivered in road transport (80% Euro 6 diesel cars, 92% euro 6 gasoline cars and 97% euro 6 diesel trucks), 24% will be delivered in the energy sector (less solid and liquid fuel use; CLE control = IED), 9 % will be delivered

in industry (mainly CLE control: IED-ELVs, MCPD-ELVs, BATAELs) and 18% will be delivered by renewal of non-road mobile machinery (stage IV ...).

The reduction that ES already achieved in 2013/2014 is -44%. Without strong increases in activities (which is not expected by GAINS) there is sufficient reduction potential available between now (2014) and 2030 to reach the proposed target of -66%: additional reductions in road (penetration of euro 6), the energy sector and industry (activity changes, IED) and non-road (NRMMD) should decrease emissions beyond 2014 further to reach about 450 kt in 2030 (corresponding to -66%).

Latest info provided by ES mid Nov 2015 indicated that it could go no further on NOX than -62% (without giving any further details). A margin of 4% points (which is around 50 kt or 20% of the additional required reduction compared to the 2014 level) should certainly be sufficient to give ES the necessary relief.

3. $PM_{2.5}$

With (i) the necessary corrections to the emission inventory for the base year 2005 (in particular adding the PM2,5 emissions from field burning of agricultural wastes which have been omitted)[1], (ii) banking on available (EU) emission source legislation (IED, MCPD, Eco-design, Euro 5/6 and stage IIIb/ IV standards) and (iii) banning field burning of agricultural wastes (a major source of PM2,5 emissions in Spain; 1/5 of total PM2.5 emissions according to GAINS in 2005) a target of more than -50% (the weaker target that was accepted for ES in the general approach) should be possible. The banning of field burning of agricultural wastes alone would be responsible for a reduction of the PM2,5 emissions of around 20% compared to 2005.

Reducing the target from -62% to -54% would give ES sufficient margin in:

- addressing the PM2,5 emissions from domestic wood combustion (mainly from stoves), where a more realistic turnover to improved and new stoves might be less optimistic than what GAINS has optimized (GAINS assumes in the OPT scenario that 100% fireplaces, stoves and boilers are improved or new by 2030). Applying a control strategy closer to CLE (with part of the domestic heaters not yet controlled) would decrease national reductions with a few % points. Considering a possible higher biomass use in 2030 than GAINS assumes (reported biomass consumption in households has already increased with about 20% between 2005 and 2014, more than what GAINS assumes) could reduce the reduction potential slightly more. On the other hand again, the new eco-design standards for new domestic wood stoves may provide additional reductions in $PM_{2.5}$ emissions from domestic combustion than estimated by GAINS and ES: note in this context that the real life PM2.5 emission factors for wood burning stoves that would result from the new eco-design standards that are set for these appliances would be around 75 g/GJ, while the EF used in GAINS for improved and new stoves are 189 and 102 g/GJ.
- addressing the PM2.5 emissions from field burning of agricultural waste: not banking on a full ban of field burning practices (75% instead of 100% ban, to account for incidental firing and difficulties to fully enforce a 100% ban) would reduce the reduction potential in GAINS with 4 to 5% points. Note that the national reduction potential of -50% that ES proposed for the general approach only considers a reduction of 2/3 of the emissions from field burning. The

difference between banning 75% or 66% of field burning represents a difference in overall reduction of 1 to 2 % points.

As noted above, an alternative to tightening the PM2,5 target from -50% to -54% would be to tighten its SO2 target from -87% (TSAP16 target) to -88%. This would deliver the same result in reducing ambition loss that ES suffered in the general approach.

[1] *Note that there is a mismatch of more than 50% in 2005 estimates between ES and GAINS (omission of field burning, cigarettes, fireworks and BBQ ... in ES emission inventory), complicating a proper analysis. ES reports emissions from field burning for NOX, VOC, NH3 and SO2, but not for PM2.5, which does not make sense: this omission has a considerable impact on the available reduction potential for ES. It needs to be corrected.*

4. VOC

Proposed cost-optimized TSAP16 target of -39% was retained for the general approach.

5. NH_3

The proposed target of -21% seems technically feasible, in particular taking into consideration that latest projected animal numbers reported by Spain (for cattle, pigs, sheep and poultry) are lower than the GAINS numbers. The reduction potential that GAINS calculated for the use of mineral fertilizer is also moderate (requiring only 20% substitution of urea based fertilizer). GAINS mainly identifies reduction potential for pigs, poultry and dairy farms (with most reduction potential for pig farms). ES claims it cannot do more than -16% on the basis of the control strategy that GAINS defined for NH3, without substantiating that claim any further. This can be maintained on the basis that PM2.5 target is tightened to -54%, or alternatively that the SO2 target is tightened to -88%.

2.27. Sweden

The analysis below provides the technical explanation for SE on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP	2030 Council	**2030 New**
							-52.2%	-48.3%	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2015)				Reduction commitments new NECD			
	kt	% reduction compared to 2005 national emission total							
SO_2	36.4	36.1	-26	-34	-25	-22	-22 [-14]	-22	**-22**
NO_X (*)	200.2	170.6	-26	-28	-53	-36	-66	-66	**-66**
$PM_{2.5}$	32.0	26.6	-13	-23	-25	-19	-19 [-17]	-19	**-19**
VOC (*)	205.4	190.2	-17	-19	-30	-25	-39	-36	**-36**
NH_3	54.0	57.4	-5	-6	-35	-15	-17	-17	**-17**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

B. Analysis of proposed 2030 targets

1. SO_2

The stricter 2020 Gothenburg Protocol target of -22% was retained for the 2030 target in the general approach. The reductions achieved in 2013 and 2014 are already overshooting this target of -22%.

2. NO_X

Proposed cost-optimized TSAP16 target of -66% was retained for the general approach.

3. $PM_{2.5}$

The stricter 2020 Gothenburg Protocol target of -19% was retained for the 2030 target in the general approach. The reduction achieved in 2014 is already overshooting this target of -19%.

4. VOC

Proposed TSAP16 target of -39% was Sweden's major concern. A relatively small margin of 3%points (with negligible impact on overall loss in health reduction ambition) is sufficient to accommodate this concern.

5. NH_3

Proposed cost-optimized TSAP16 target of -17% was retained for the general approach.

2.28. United Kingdom

The analysis below provides the technical explanation for UK on the basis for the 2030 reduction percentages set out in Council document 10607/16.

A. Summary table

Pollutant	2005	2005	2013	2014	2030 WeM	2020	2030 COM/EP	2030 Council	**2030 New**
							-52.2%	**-48.3%**	**-49.6%**
	GAINS (2014)	Reported emissions (2016) and reported 2030 projections (2016)				Reduction commitments new NECD			
	kt	% reduction compared to 2005 national emission total							
SO_2	721.4	711.3	-46	-57	-80	-59	-89	-87	**-88**
NO_X (*)	1515.7	1616.8	-36	-41	-65	-55	-74	-72	**-73**
$PM_{2.5}$	92.8	108.4	0	-3	-13	-30	-53	-45	**-46**
VOC (*)	1062.8	1036.3	-30	-31	-34	-32	-39	-39	**-39**
NH_3	310.2	306.5	-11	-8	-9	-8	-24	-11	**-16**

(*) minus NO_X and VOC emissions from agriculture (categories NFR 3B and 3D)

According to the GAINS analysis a significant proportion of the necessary reductions for SO_2 and NO_X will be delivered by phasing out the use of coal in the power plants. It is positive to note that the decline of coal use has already started and will continue in 2016 (with four more big stations closing, leaving six operational). The UK government has pledged to close all coal power plants by 2025.

B. Analysis of proposed 2030 targets

1. SO_2

A national SO2 reduction close to the proposed TSAP16 target of -89% seems realistic. Decreased use of coal and HFO in combination with application of adopted legislation (IED-ELVs for LCP, MCPD-ELVs, IED-BAT, new BATc for LCP coming up, SECA) will deliver the necessary reductions. According to GAINS most part of the required reductions (65%) will be delivered by the almost complete phase out of coal in power plants. This is in line with UK's willingness to further phase out the use of coal before 2030: on 18 November 2015, the UK energy minister, Amber Rudd, announced that the UK's remaining coal-fired power stations must be shut down by 2025 at the latest. UK also confirmed that its projections on domestic were conservative and that more can be reduced here (about an extra 2% reduction). The SO2 emissions from the domestic sector in the UK are mainly linked to the use of (low quality) coal in the households. According to GAINS SO2 emissions from the domestic sector will go down as the result of a reduction of the use of coal and a switch to low S coal. Reported activity levels of coal use in households by the UK for the period 2005 and 2014 seem already to show a downward trend in coal use from 2005. A margin of 1% should suffice to accommodate outstanding discrepancies (i.a. in industry). A target of -88% is deemed realistic and achievable.

2. NO_X

The initial national reported projections for road, energy sector and industry seemed too conservative (resulting in a national reduction of -63%). A target of at least -72% should be feasible (= GAINS CLE). GAINS used a conformity factor of 1,5 for euro 6 diesel cars/LDV, the UK used a higher CF (2,5-2,8; Copert). The difference of 25 to 30 kt results in an extra 2% reduction points above the -70% proposed by the UK in Nov 2015. There is likely some extra reduction potential (1% point) available in the PP sector considering the new BATc for LCP's that are in the pipeline. A target of -73% is deemed realistic and achievable.

3. $PM_{2.5}$

PM2,5 was not discussed during the bilateral with COM on 30/10, but UK did inform the COM that a target of -46% would be feasible (already 1% point above what UK proposed for the general approach).

According to the GAINS analysis, activity changes adds 25% PM2,5 emissions compared to the 2005 level. Around 67% of the required reductions to reach the proposed TSAP16 target of -53% will be delivered by CLE controls (PP, road, non-road) and 33% by additional controls (PP, industry). Main discrepancies between GAINS and national views seem to centralize around emission estimates and projected reduction potentials for industry and domestic combustion. Proper application of the IED-ELVs, the new MCPD-ELVs, BATc and the new ED requirements for domestic boilers and local space heaters should allow delivering most of the necessary reductions. A less optimistic view on switching to cleaner technologies (automatic boilers) or renewal of existing stock could result in loss of reduction potential of a few % points. It is not entirely clear to what extent UK has already banked in its projections on the reduction potential of banning field burning of agricultural wastes and small scale open burning which according to GAINS could account for about 3%.

Overall a target of -49% should be in reach for the UK.

To be noted however is that the PM2,5 emissions were very recently (2016 submission) revised upwards, apparently mainly as a result of a revision of the biomass balance: PM2,5 emissions from residential heating (NFR 1A4bi) for the base year 2005 were revised upwards from 12,2 kt to 23,2 kt. Reported biomass use for this sector was adjusted for the base year 2005 from 12 to 30 PJ. For the year 2013 biomass use was revised from 29 to 68 PJ. In GAINS biomass use in households goes up from 10 PJ in 2005 to 42 PJ, much lower than current national estimates. This may additionally affect the national reduction potential and make a target in the range of -46% to -48% technically more reasonable.

4. VOC

Proposed cost-optimized TSAP16 target of -39% was retained for the general approach

5. NH_3

GAINS identifies reduction potential for poultry, pigs, dairy cattle and inorganic fertilizer use. The UK mainly sees reduction potential for pigs and expects an increase in the number of dairy cows with about 25% (0,5 M). GAINS on the other hand assumes a drop in dairy cows with 10%, but an overall increase in milk production with 10% (average milk yield per cow increases with about 20%).

Applying the GAINS control strategy to UK's projected number of dairy cows for 2030 (2,5 instead of 1,9 M) would add an extra 20 kt in 2030 corresponding to a loss of 6 à 7% reduction points.

Applying reduction lower substitution rate for urea based fertilizers (around 50% instead of 90%) would further impact the reduction potential with 1 to 2% points.

A target of -16% should be feasible even when considering UK's projected increase in dairy cattle of 25% and a lower substitution rate for urea based fertilizer.

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