12.2 Exceeding the NO_X ceiling

12.2.1 Gothenburg protocol adjustment process

In the framework of the Gothenburg Protocol, in case of exceeding the national emission ceilings, the decision 2012/12 ECE/EB.AIR/113/Add.1 defines a procedure to make adjustments of national emissions inventories, in order to compare them with the initial reduction commitment. This procedure can be applied in the three following situations:

- In case of new sources of emissions that were not previously taken into account when determining the ceilings.
- In case of significant changes in emissions factors.
- Usually, in case of major changes in methodology on the determination of emissions.

Thus, this adjustment procedure allows to assess the compliance (or not) to the ceilings in comparable conditions, disregarding improvements in emission inventories that prevent from meeting the reduction commitment (given that the emission ceilings are not revised according to the progress of science and technology knowledge unlike emission inventories).

The NO_X ceiling set for France under Gothenburg Protocol is 860 Gg to be reached from 2010, but France emissions for 2010, 2011 and 2012 are respectively 1067 Gg, 1001 Gg et 983 Gg.

Taking into account this adjustment procedure, the NO_X emissions of France for 2010, 2011 and 2012, even if exceeding the limit set by the Gothenburg Protocol does not necessarily imply that France has not fulfilled its reduction commitments taken at the signing of the Protocol. These ceilings in absolute values in 1999 were set according to methodologies at that time. Nevertheless, methodological developments were performed between the years of setting the ceilings and nowadays which have contributed to the Party being unable to meet its NOx reduction commitments for the years 2010, 2011 and 2012.

Under the adjustment procedure, France report its NOx "adjusted" national emissions applying old methodologies for 2010, 2011 and 2012 (cf. the next table). This table shows that by applying the same initial methodology, NO_X emissions for France are 876 Gg in 2010, still slightly over the ceiling (+16 Gg). Nevertheless, NO_X "adjusted" inventories of 2011 and 2012 are below the Gothenburg Protocol ceiling. Detailed NFR tables on adjustments are available in annex 12.

Table 1 : France objectives, adjustments and situation in 2010, 2011 and 2012

Source CITEPA / Format CEE-NU - mars 2014 NOx adjustem

		NOx (Gg)		
		2010	2011	2012
National total	**National total for the entire territory**	**1067.1**	**1000.8**	**982.9**
Adjustments (Net total)	Sum of adjustments (negative value) from Annex VII	-191.1	-184.9	-166.2
National total for compliance	**National total for compliance assessment**	**876.0**	**815.9**	**816.7**

France produces emission projections in connection with its national emission inventories. These projections enable to assess when France will meet its reduction commitment, without adjusting its inventories. Thus, with a linear regression of historical emissions (2010, 2011 and 2012) and the projections of emissions presented in table 25 for 2015 and 2020, it can be noticed that France would not meet its NO_X ceiling commitment before 2015 without adjustments.

The description of methodological changes justifying the adjustment procedure is given in the next sections for the 3 sectors for which adjustments are implemented.

12.2.2 Methodology Changes in NFR 1A2f, industry combustion/other

In the case of the determination of NOx emissions for industry combustion/other sectors, a methodological revision took place between inventories realized more than 15 years ago and those updated more recently. Since 2008, a specific estimation of the non-road mobile machinery consumption (gas oil) for building and public construction was introduced (inventory corresponding to December 2008).

a. Original methodology used

When NOx emission ceilings were determined, NOx emissions for non-road mobile machinery in building and public construction (BTP, "Bâtiments et Travaux Publiques") were not estimated separately from emissions of stationary plants because of the share of energy consumption for building and public construction (gas oil) were not known by the SOeS (French statistical service for energy and environment, in charge of compiling the national energy balance).

Therefore, the consumption of gas oil for non-road mobile machinery in building and public construction (BTP) was included in the overall consumption of the industry sector provided by the SOeS. Nevertheless SOeS provided the consumption rate for non-road mobile machinery (without BTP) corresponding to 6%. The NOx boiler emission factors were applied to the consumption for non-road mobile machinery in building and public construction (BTP), but NOx boiler emission factors are much lower than those for non-road mobile machinery, cf. section c. So in the past the consumption of non-road mobile machinery was underestimated by SOeS (consumption from BTP machinery was not reported with mobile sources but included within stationary plants).

An analysis of the years 2005 and 2006 before the methodology changes confirms that the consumption of gas oil was distributed as follows: 94% for boilers (which in fact included machinery from building and public construction) and 6% for non-road mobile machinery (which did not take into account machinery from building and public construction) .

b. Evidence that the original methodology was used for determining the emission reductions at the time when they were set

It is only since December 2008 inventory that CITEPA has specific consumption data for gas oil for the machinery from building and public construction. Consumption is directly communicated annually by the SOeS based on data transmitted to the IEA (International Energy Agency). This distinction of the gas oil consumption for building and public construction was not made before 2008, and the ceilings were calculated by using the original method described above.

c. Description of the updates methodology used

Since December 2008 inventory, SOeS has given CITEPA gas oil consumption for building and public construction since the year 1990, each year. These data were given annually by the SOeS to the IEA. Consumption in building and public construction is significant, accounting for 92% of the overall consumption of non-road mobile machinery for gas oil in 2012.

For the years 2010, 2011 and 2012 in the latest version of the inventory - December 2013 (i.e. updated method), gas oil consumption is allocated as follows: 6% for boilers (excluding building and public construction) and 94% for non-road mobile machinery (including building and public construction), which is almost the reverse in terms of allocation compared to the original method.

The NOx emission factor for gas oil used in boilers depends on the use and the plant capacity:

- for large boilers with more than 50 MW, the NOx emission factors are taken directly from the LCPD inventory (Large Combustion Plant Directive) conducted annually by CITEPA
- for small boilers with less than 50 MW, the NOx emission factor derived from the literature.

For non-road mobile machinery in industry, the NOx emission factor changes over time due to regulations.

NOx emission factors are presented in the following table. They are based on the latest available consumption data for the latest version of the inventory (submission of 15 February 2014). The same emission factors are used for the original and the updated methodologies for the years 2010, 2011 and 2012.

Table 2 : NOx emission factors for gas oil

	Average NOx emission factors for the different boilers (g/GJ)	Average NOx emission factors for non-road mobile machinery (including building and public construction) (g/GJ)
2010	100	638

2011	100	578
2012	100	491

d. Comparison of emissions estimates made using the original and updated methodologies

The methodology used to estimate emissions in 2010, 2011 and 2012 on the basis of the original methodology (non-road mobile machinery for building and public construction included within boilers) is as follows:

- Use of gas oil consumption in 2010, 2011 and 2012 (last inventory) of all boilers and non-road mobile machinery with older allocations of consumption between boilers and non-road mobile machinery (see part a.).

- Using the same NOx emission factors for boilers and non-road mobile machinery as presented in Table 28.

The results of NOx emissions are shown in the following table for the industrial sector (1A2f).

Table 3 : Comparison of NOx émissions between the different methods used for gas oil in industry (1A2f)

	NOx Emissions (t)					
	Boilers		Non-road mobile machinery		TOTAL (boilers and non-road mobile machinery)	
	Original method	Updated method*	Original method	Updated method*	Original method	Updated method*
2010	2 686	88	1 094	17 658	3 779	17 745
2011	3 167	582	1 169	16 083	4 336	16 666
2012	2 971	182	931	14 833	3 902	15 015

* : Data from the latest edition of the inventory (submission of 15 February 2014)

e. Rationale for deciding whether the change in methodology is significant

Given the information described above, the consideration of non-road mobile machinery for building and public construction has an important impact on NOx emissions within the industry sector. It is due to significant differences in NOx emission factors between boilers and engine of non-road mobile machinery on the one hand and, secondly, the significant share of the building and public construction sector in the consumption of gas oil in this sector 1A2f.

Thus, the inclusion of this methodological change since 2008, represents an increase of emissions of between 11 and 14 kt depending on the year. This results in adjustments with negative values (see table below).

Table 4 : NOx emission impacts by taking into account specifically gas oil consumption from machinery in building and public construction and their related EF in NFR 1A2f

	Adjustment for NOx emissions for NFR 1A2f (kt)
2010	- 13,97
2011	- 12,33
2012	- 11,11

12.2.3 Methodology change in NFR 1A4cii, Other mobile & machinery - Agriculture

a. Original methodology used

The methodology used when the emission ceilings of the Gothenburg Protocol were set, was based on national energy balances from the statistical service of the French ministry for Ecology, Sustainable development and Energy, before the 2009 statistical methodology change. Before 2009, there was no specific information on the energy consumption of the agricultural network. Therefore, the consumption allocation between the tertiary and the agricultural sector tended to underestimate the agricultural sector consumption to the detriment of the tertiary sector. It literally means that a part of the agricultural machinery oil consumptions (NFR 1A4c) was affected to the tertiary sector which NO_x emission factor (100 g/GJ) is far less important that the one dedicated to agricultural machineries.

b. Evidence that the original methodology was used for determining the emission reductions at the time when they were set

It was in May 2009 that the French statistical service for energy and environment (SOeS) revised its statistics declaration (cf. "Bilan énergétique de la France pour 2008", mai 2009, CGDD/SOeS, page 43[1]). When the emission ceilings were set in 1999, the national inventories were based on the previous statistical series for energy (before the updated statistical series on 2009).

c. Description of the updated methodology used

The methodology presently used (and since the inventory submitted in 2010) is based on new statistical series (revised in May 2009), for which the energy consumption allocation between agricultural and tertiary sectors has been revised. With this change, the agricultural sector gained 800 000 toe of oil product (gas oil) in 2008, which corresponds to a 42% increase, deducted from the tertiary sector. Those quantities of oil product shifted to the agricultural sector are affected with a more important emission factor than the one attributed to stationary installation. Those factors can vary overtime due to technology and regulation evolution (e.g. NOx emission factor for gas oil in 2010, 884,6 g/GJ for agricultural machineries).

d. Comparison of emission estimates made using the original and undated methodologies

The determination of the difference between the two sectors in terms of NO_x emission, is based on:

[1] http://www.statistiques.developpement-durable.gouv.fr/fileadmin/documents/Produits_editoriaux/Publications/Chiffres_et_statistiques/2009/bilan%20energ%2008%20corrig%C3%A9.pdf

- The last oil product consumption statistics for the agricultural sector, 3,2 Mpet in 2010, 3,13 Mpet in 2011 and 3,14 Mtep in 2012, for the present method.
- The "adjusted" consumption that would have been determined with the previous method for 2010, 2011 and 2012 based on the transition year in 2008 (relating to the 42% increase in agriculture consumption deducted from the tertiary sector when the statistical series was changed).
- The same NOx emission factors, stationary installations and agricultural machineries, for both methods, i.e. 100 g/GJ for stationary installations and for agricultural machineries: 884,6 g/GJ in 2010, 822,8 g/GJ in 2011, 758,4 g/GJ in 2012.

With the present method, NO_x emissions are more important than with the previous one because of the higher emission factor of agricultural machineries, and the increase of the share of fuel consumption for the agriculture machineries versus the tertiary sector. These changes have led to differences in NOx emission (globally for agriculture machineries and tertiary sector) for the years 2010, 2011 and 2012 of respectively: - 30 kt, -28 kt, -26 kt (initial method – present method). In terms of reporting of the adjustment, these differences have been allocated into the NRF code 1A4c ii.

e. Rationale for deciding whether the change in methodology is significant

Considering the important difference in emission factors for the agricultural machineries and the stationary installations, it is important to have more reliable consumption allocations between those two activities. The methodological adjustment (- 30 kt) represents 30 % of the updated methodology for agriculture machineries (103 kt).

12.2.4 Methodology changes in NFR 1A3b, Road transport

a. Original methodology used

The methodology used by CITEPA for road transport emissions when determining emissions ceilings of the Gothenburg Protocol (1999), was the second version of the EMEP/CORINAIR guidebook corresponding to COPERT II software. This method proposed NOx emission factors for passenger cars (PC) and light commercial vehicles (LCV)[2] up to Euro 1, as well as heavy duty vehicles (HDV) only up to the emission standard pre- EURO I.

The emission factors for the most recent standards were derived by applying the expected reductions in emission standards.

b. Evidence that the original methodology was used for determining the emission reductions at the time when they were set

When determining emission ceilings of the Gothenburg Protocol (1999) and during the negotiations of these ceilings by France in Geneva, the current methodology, recommended at European level was the COPERT II methodology. The proposed emission ceilings were the result, as today, of the work of IIASA.

[2] Also called light duty vehicles (LDV) in previous guidebooks.

c. Description of the updated methodology used

The updated methodology, used in 2013, is the version of EMEP/EEA guidebook[3] that corresponds to emission factors of COPERT 4 v10 software[4]. This methodology considers the emission factors of PC and LCV up to the Euro 4, and for Euro 5 and Euro 6 emission standards assumptions related to limit values. For HDV, the emission factors are given up to the EURO VI emission standard, the latest implementation.

d. Comparison of emission estimates made using the original and updated methodologies

The values of NOX emissions presented in the table below are estimated:

• With COPERT III model equations for the values of the initial method (change between COPERT II and COPERT III had no influence on NO_X) .

• With the COPERT 4 model equations for the values of the present method.

The activity values (traffic by type of vehicle /engine capacity or mass/emission standard) are those of the latest edition of the inventory.

Tableau 5 : Adjustment impacts on NOx emissions of NFR 1A3b sector (road transport)

year	Initial method (COPERT III) – (kt)	Present method (COPERT 4) – (kt)	Difference (kt)	Difference (%)
2010	431,5	578,2	- 146,7	- 25%
2011	411,2	555,9	- 144,7	- 26%
2012	396,7	526,1	- 129,5	- 25%

e. Rationale for deciding whether the change in methodology is significant

The table above shows that the change in methodology for NOx emissions from road transport has an important impact (-25% adjustment for the year 2010), knowing also that road transport is the first key source of NO_X.

[3] http://www.eea.europa.eu/publications/emep-eea-guidebook-2013/part-b-sectoral-guidance-chapters/1-energy/1-a-combustion/1-a-3-b-road-transport
[4] http://www.emisia.com/files/COPERT4_v10_0.pdf