# **Summary of emission relevant Guidebook changes**

The following document gives an overview of all 2023 Guidebook changes which have led to changes in emission factors in Combustion and Industry chapters. It is important to note that there have been other changes to Combustion and Industry chapters in the 2023 update, for example text clarifications and additional guidance, however these have not had a direct influence on emission levels and therefore are not discussed here.

## **Cross-cutting aspects**

### **Limit of quantification**

**The limit of quantification (LOQ):** is the lowest concentration of a pollutant which can be quantified with a specified accuracy; analytical results are always above the limit of quantification (in cases of measurement results < LOQ, usually LOQ or half of LOQ is used, marked with a “<“)

**The limit of detection (LOD):** is the lowest concentration of a pollutant which can be detected (usually not published: internal value of the measurement institute)

All Default emission factors which are based on measurement data below the limit of quantification are marked with a “<” sign in order to increase transparency. Nevertheless, the emission factor should be used directly for the calculations.

There are different ways of dealing with values below LOQ. For example, inventory compilers could use of the LOQ, o half of the LOQ, or zero. The use of zero would be only appropriate in cases where the emission is impossible due to the chemical composition of the fuel or input material of the process. In such cases the notation key NA is used (for example PAH, PCDD/F from natural gas combustion). In most of the cases where an emission is theoretically possible, the value is below the LOQ, and there is no clear documentation, the LOQ or half of the LOQ is used. In order to avoid confusion, it is recommended that inventory compilers use the default values unchanged.

### **Pollutants where no data is available (NE)**

In some cases, the set of default emission factors is incomplete due to the lack of data. Therefore, the notation key NE is used. However, this does not require the party to report emissions as NE.. If a party has country-specific data, it should be used. The Combustion and Industry co-chairs are keen to hear from anyone who is aware of data that could be used to support future updates of the Guidebook.

If there are any problems with the new fuel allocations please let the co-chairs know. Splitting gaseous fuels into natural gas, refinery gas, blast furnace gas and biogas could cause challenges with ensuring time series consistency.

## **1.A.1.a Public electricity and heat production**

### **Heavy metals and POPs**

With a few exceptions, emission factors for heavy metals and POPs are only available for Tier 1methodologies. In order to avoid duplicating information, most of the HM and POPs emission factors have been removed from the Tier 2 emission factor tables in the 2023 update. This change has been made in order to increase transparency and clarify that in most cases emission factors for these pollutants are consistent with a Tier 1 approach. The emissions are still relevant but all the information on HM and POPs emission factors is provided in the Tier 1 emission factor tables.

### **New emission factors**

New emission factors have been added for:

* Biogas
* Blast furnace gas

As a result, the fuel category “gaseous fuels” has been changed to “natural gas”.

Please note that the emission factors for biogas are not applicable for biomethane. If biomethane is used instead of biogas, emission factors for natural gas are more appropriate, except for SO2. The default SO2 emission factor for biogas is too high for biomethane and the emission factor for natural gas is too low for biomethane. Country specific biomethane emission factors should be used derived from national gas quality requirements for as that is fed into the gas network.

## **1.A.1.b Petroleum refining / 1.B.2.a.iv Fugitive emissions oil: Refining and storage**

Both refinery chapters have undergone considerable updates. Please read the chapters carefully.

### **Allocation**

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| --- | --- | --- | --- |
| Emission source | Pollutant | 1.A.1.b | 1.B.2.a.iv |
| Process furnaces and boilers | NOX, CO, SOX, TSP, PM, BC, NH3, HMs, POPs | Yes | No |
| All emission sources (combustion + process + fugitive) | NMVOC | No | Yes |
| All emission sources (combustion + process) | NH3 | Yes | No |
| fluid catalytic cracking units (FCCU) and catalytic reforming units (CRU) | NOX, CO, SOX, TSP, PM, BC, NH3, HMs, POPs | No | Yes |
| Sulphur recovery | SOX | No | Yes |

Note that the suggested default allocation method is a pragmatic solution in order to avoid double-counting or underestimation. If country-specific data is used it may be necessary to alter allocations accordingly. The selected allocations must be transparently described in the IIR.

### **1.A.1.b Petroleum refining - new Tier 1 approach**

The Tier 1 methodology has been changed completely in order to avoid underestimation. The new emission factors cover all fuels (not only refinery gas). The new Tier 1 emission factors are derived from Tier 2 emission factors representing the fuel mix of all EU 27 refineries in 2021. Crude oil input is used as the activity data (and not a fuel). It is assumed that crude oil consumption data are more readily available for countries that are using default values. An alternative approach involves using the average fuel mix combined with Tier 2 emission factors. This is mentioned in the notes of the Tier 1 emission factor table. For calculating the new Tier 1 emission factors, fuel specific Tier 2 emission factors were used which represent unabated emissions.

All NMVOC default emission factors are reported in source category 1.B.2.a.iv Fugitive emissions oil: Refining and storage since it is not possible to differentiate between combustion related and fugitive emissions. Similarly, all NH3 emissions are allocated to 1.A.1.b Petroleum refining. In cases where a mix of country specific emission data and default emission factors are used, it is necessary to ensure that all pollutants and emission sources are covered. If in such a case combustion related NMVOC emission factors are necessary, default EFs from chapter 1.A.1.a Public electricity and heat production can be used.

The old Tier 1 emission factors of refinery gas have been moved to Tier 2 (process furnaces). Please note that new SO2 emission factors are available.

### **1.B.2.a.iv Fugitive emissions oil: Refining and storage - new Tier 1 approach**

New Tier 1 emission factors were derived using Tier 2 emission factors for fluid catalytic cracking units (FCCU) and catalytic reforming units (CRU). Strictly speaking, both processes are not fugitive sources but combustion sources. In order to avoid confusion it makes sense to present the two Tier 1 methods in different Guidebook chapters. For activity data the same unit is used (crude oil consumption) due to the availability of data. The Tier 1 emission factors consider emission control. This ensures that the use of the Tier 1 emission factors is possible for all countries. It can be assumed that most of the refineries have some kind of emission control systems since unabated emissions from the FCCU are extremely high. Some refineries may have no FCCU plant.

For sulphur recovery plants only Tier 2 emission factors are available. This process is not covered by the Tier 1 approach.

## **1.A.4 Small combustion**

New Tier 1 and Tier 2 emission factors for NH3 from wood combustion are available.

## **2.H.1 Pulp and Paper**

There have been several changes to the Tier 2 approaches:

* updated SO2 emission factors for the acid sulphite process
* new SO2, NOX, CO and TSP emission factors for the neutral sulphite semi-chemical process (NSCC)
* a new table for mechanical pulping where only NMVOC is relevant

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