**Additional measures that have not yet been implemented are assigned to the WAM scenario**


**Optional amendment of the 13$^{th}$ BImSchV**

The German Federal Government declared in its current NAPCP 2023, that an optional amendment of the 13$^{th}$ BImSchV will be considered for solid (other than coal), liquid and biogenic fuels in case there is non-compliance with the reduction commitment for $NO_x$ projected. Because it is very difficult to define all solid (other than coal), liquid and biogenic fuel uses in installations falling under 13$^{th}$ BImSchV in the inventory database, as there is often not only one single fuel used in those installations or complex calculations for an overall emission limit value of all installations falling under one facility (e. g. for refineries) are necessary, only for three exemplary categories of installations a hypothetical $NO_x$ mitigation potential was

quantified. This follows a conservative approach and does not anticipate any political decision. Thus, in the updated WAM scenario reported in 2025 mitigation potential is only assumed for 2035 at the earliest.

- **potential $NO_x$ reduction in pulp and paper production through an optional amendment of the 13th BImSchV:**

According to the existing 13th BImSchV (as of 2021), different maximum amounts of $NO_x$ emissions are permitted according to the production process (sulphate and sulphite process) and the size of the plant (measured in RTI in MW) in pulp and paper production (NFR sector 2.H.1).

It is assumed for the sulfite process that all plants located in Germany are operated with an RTI of 50-300 MW. A maximum emission factor of 300 mg/Nm³ for all plants according to the 13th BImSchV is assumed for the further calculation of the reduction potential. The $NO_x$ emission factor for the sulfite process was taken over from the 2024 submission in the year 2010, which is 2 kg/t. The new emission factor results from the historic emission factor (2 kg/t) and the maximum emission value proposed for the optional amendment (85 mg/Nm³) divided by the calculated mean value of the currently applicable law (300 mg/Nm³). This results in an emission factor of 0.57 kg/t for 2035 onwards as shown in (5).

```
  (5) implied NOx emission factor (sulfite process) = (2 kg/t * 85 mg/Nm³) / 300 mg/Nm³ =
0.57 kg/t
```

In the field of the sulfate process (also known as kraft process) a weighted maximum average emission factor according to the limit values of the 13th BImSchV was assumed as shown in equation (6).

```
  (6) implied NOx emission factor (sulfate process) = 0.36 * 250 mg/Nm³ + 0.64 * 200 mg/Nm³ =
217.78 mg/N³
```

The implied emission factor for the sulphate process was taken over from the 2024 submission in the year 2010. The new emission factor results from dividing the 2010 emission factor and the maximum emission value proposed for the optional amendment of the 13th BImSchV by the calculated mean value of the currently applicable law. This results in an emission factor of 0.68 kg/t for 2035 onwards as shown in equation (7).

```
  (7) implied NOx emission factor (sulfate process) = (1.75 kg/t * 85 mg/Nm³) / 217.78 mg/Nm³
= 0.68 kg/t
```

- **potential $NO_x$ reduction in refineries through an optional amendment of the 13th BImSchV:**

An optional amendment of the 13th BImSchV would lead to emission reductions in the area of refineries and is assigned to the WAM scenario. It causes a reduction in the emission factors in the affected time series of the NFR sector 1.A.1.b. A distinction must be made between refinery plants and the fuel input used by them. For plants using crude oil (naphtha), light heating oil or other petroleum products, the proposed $NO_x$ limit value is set to 85 mg/Nm³ and adopted as the future maximum emission level. Some refineries in Germany get permission by applying a so-called bell rule, whereby individual parts of the plant are allowed to exceed fuel specific limit values, if the facility in total for all installations and used fuels complies with an average limit value calculated with the help of a so-called bell curve.

For plants where a future limit value of 85 mg $NO_x$/Nm³ is assumed, conversion factors based on specific flue gas volumes for heavy fuel oil or light heating oil (Table 4) were used to convert to kg $NO_x$/TJ, shown in equation (8) for the example of refinery underfiring in LCP with light heating oil as fuel.

```
  (8) implied NOx emission factor (refinery underfiring with light heating oil) = 85 mg/Nm³ /
3.49 = 24.4 kg/TJ
```

This results in future $NO_x$ emission factors of 24.4 kg/TJ for light heating oil and 25.1 kg/TJ for other petroleum products from 2035 onwards.

For all plants that are assumed to use permission by applying the so-called bell rule, the potential effect of integrating a $NO_x$ limit value of 85 mg/Nm³ for a part of the fuels used in such plants was quantified by estimating a relative reduction. Therefore, it was assumed that the current mean emission factor for one exemplary refinery permitted by using the so-called bell rule is 274.75 mg/Nm³. The application of the proposed future limit value for all solid (other than coal), liquid and biogenic fuels used in this plant will lead to a mean emission factor of this specific refinery of 189.75 mg/Nm³. This results in a relative reduction of 69 percent, as shown in equation (9)

```
  (9) percentage NOx emission reduction (specific refinery) = 1 - (189.75 mg/Nm³ / 274.75
```

```
mg/Nm³) = 0.69
```

This exemplary relative reduction was than assumed to apply for all refineries permitted by using the so-called bell rule from 2035 onwards. Therefore, the current emission factor in the inventory out of submission 2024 is multiplied with this relative reduction. As an example, the resulting emission factor applied from 2035 onwards for refinery underfiring with heavy fuel oil is shown in equation (10).

```
  (10) NOx emission (refinery underfiring with heavy fuel oil) = 118 kg/TJ * (1 - 0.69) =
36.5 kg/TJ
```

- **potential $NO_x$ reductions in other large combustion plants through an optional amendment of the 13th BImSchV:**

Emissions from other LCPs, which emerge from the energy balances and cannot be clearly assigned to a specific fuel use or fuel mix, but also show a reduction potential by an optional amendment of the 13th BImSchV are assigned to the NFR sectors 1.A.1.a, 1.A.1.c and 1.A.2.g.viii and a potential reduction in the $NO_x$ emission factors was estimated.

The $NO_x$ emission factors for all non-gaseous materials other than coal for electricity and heat generation are considered and the maximum emission value for $NO_x$ is assumed to be 85 mg/Nm³ from 2035 onwards. According to the 13th BImSchV, only plants with more than 1,500 operating hours per year are taken into account for which the proposed limit value of 85 mg $NO_x$/Nm³ applies. Table 13 shows the estimated relative and absolute plant split of the LCP according to their annual operating time assuming an equal fuel use distribution.

Table 13: Estimated relative and absolute plant split of LCP according to annual operating hours

| operation time | RTI in MW | proportion |
|---|---|---|
| < 1500 h/a | 46573 | 17.8 % |
| > 1500 h/a | 214990 | 82.2 % |
| total | 261563 | 100 % |

First, the limit value of 85 mg/Nm³ is converted into kg/TJ using the fuel specific conversion factor (Table 4). The new emission factor results from the sum of the reduction for the 82.2 per cent of the fuel use with an operating time of more than 1500 h/a and the unchanged value from the 2024 submission for the 17.8 per cent of the fuel use with less than 1500 h/a operating time, that is assumed to be not effected by an optional amendment of the 13th BImSchV.

The calculation is shown using the example of the source category of electricity generation in large public power plants using heavy fuel oil (reference value in 2022: 43.5 kg/TJ) in (11), whereby the procedure is analogous for all other source categories.

```
  (11) NOx emission factor (electricity generation in public power plants with heavy fuel
oil) = (85 mg/Nm³ / 3.39) * 82.2 % + 43.5 kg/TJ * 17.8 % = 28.4 kg/TJ
```

**Emission reduction in small combustion installations by amending the emission limits of the Ecodesign Regulations (EU) 2015/1185 and (EU) 2015/1189:**

Through amendment of the Commission regulation (EU) 2015/1189 with regard to ecodesign requirements for solid fuel boilers, it was assumed that requirements for placing on the market and putting into service solid biomass boilers regarding emissions of particulate matter will be set at 2.5 mg/m³ TSP from 2027 (measured according to VDI 2066 Sheet 1, May 2021 edition and based on 13 % reference oxygen content).

Through amendment of the Commission regulation (EU) 2015/1185 with regard to ecodesign requirements for solid fuel local space heaters, it was assumed that requirements for placing on the market and putting into service solid biomass local space heaters regarding emissions of particulate matter will be set at 20 mg/m³ TSP from 2029 (measured according to VDI 2066 Sheet 1, May 2021 edition and based on 13 % reference oxygen content).

Considering these assumptions and the projected use of solid biomass in small combustion installations in the current WM scenario, a potential emission reduction of 0.8 kt $PM_{2.5}$ in 2030, of 1.3 kt in 2035 and of 1.8 kt in 2040 was quantified in the current WAM scenario. The absolute emission mitigation potential in 2030 and onwards very much depends on the projected biomass use as well as the year, when the proposed amendment will apply for new installations. The higher the use of solid biomass in the building sector is projected, the higher the mitigation potential of the proposed amendment of the Ecodesign requirements will be. Less stricter requirements regarding particle emissions in national policies (e. g. funding programmes) will increase the projected emissions in the WM scenario and thus, will also basically increase the mitigation potential of the proposed amendment of the EU ecodesign regulations.

Apart from that, an ambitious EU-wide regulation of PM emissions of small combustion installations will help a lot to comply with the $PM_{2.5}$ limit values of the new Ambient Air Quality Directive (EU) 2024/2881[1)] as well as the average exposure reduction obligation for $PM_{2.5}$. Otherwise, the use of solid biomass might have to be banned in certain areas or at least temporarily restricted.

**Additional reduction in agriculture compared to the German NAPCP 2023:**

For the emission projections submission 2025, in contrast to the emission projections submission 2023 as well as to the German NAPCP 2023, no further mitigation potential has been reported in the current WAM scenario regarding additional measures in the agricultural sector (NFR 3). The support measure to increase the co-fermentation of slurry in biogas production to further reduce GHG emissions of the agricultural sector has been stopped in 2024, and currently there is no other concrete measure under preparation. In addition, the support measure was not very effective due to low adoption rates in the first years until 2024. Therefore, no increase in co-digested slurry is expected above the assumptions in the WM scenario until 2030, and thus no increase of $NH_3$ emissions from digestates. Without an expected increase of emissions, and on the background of a buffer of roughly 11 (based on inventory submission 2024) respectively 28 kt $NH_3$ (based on inventory submission 2025) in the current WM scenario in the year 2030, no additional measures are necessary, and no specific WAM for $NH_3$ is calculated. The assumptions on co-fermentation of slurry in biogas production for the projections on greenhouse gas emissions (submission 2025) are documented in “Treibhausgas-Projektionen 2025 für Deutschland”[2)].

In addition, the amount of ammonia emissions from the previous year will be checked annually in the future. This should be carried out for ammonia emissions from agriculture as part of the previous year's estimate of greenhouse gas emissions in accordance with Section 5 Paragraph 1 of the Federal Climate Protection Act. The previous year's estimate is based on current statistics on important activity data for the previous year (livestock, N-mineral fertiliser sales) and must be submitted annually by March 15$^{th}$. If the ammonia emissions of the previous year's estimate are above the linear target path according to NEC Directive (EU) 2016/2284, the BMEL, in consultation with the BMUV, will develop a bundle of agricultural measures, that will assure compliance with the linear target path as soon as possible. Because of uncertainties in the emission projections a minimum gap of 10 kt is agreed. If the previous year’s estimate in the following year has again a gap of 10 kt or more, the bundle of agricultural measures enters into force immediately.

1) http://data.europa.eu/eli/dir/2024/2881/oj

2) see table 116, pages 115-116, https://www.umweltbundesamt.de/sites/default/files/medien/11850/publikationen/projektionen_2025-instrumentenpapier_korr_2.pdf