

Industrial Emissions Directive: Measurement uncertainty issues

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This analysis was prepared by the Frank Bold Society as background material for the purposes of the ongoing review of Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control, hereinafter “IED”). An international comparison has been carried out to demonstrate the **overwhelming differences in interpretation of the provisions of the IED relating to measurement uncertainty**.¹ The analysis shows that these differences influence (non-)compliance of individual sources of pollution with their specific emission limits and distort the European energy market.

According to the IED, emissions of certain pollutants (e.g. dust, NO_x, SO₂) into the air from various industrial facilities (esp. large combustion plants and waste incineration plants) shall be measured using a continuous monitoring system. The directive establishes a certain way of dealing with measurement uncertainty.² The IED suggests in Annexes V³ and VI⁴ that the **uncertainty of continuous measurement should be subtracted from the measured value** to calculate the validated value. The validated value is then compared with emission limits to verify compliance. The main interpretational difference lies in the question of what should constitute the uncertainty to be subtracted – is it the maximum uncertainty allowed or is it the real uncertainty of the measuring device at the relevant time? Based on the answer to this question, two different approaches can be observed, as evidenced by case studies from individual Member States, which were chosen to represent the whole spectrum of different approaches. In the conclusion, the analysis highlights the main issues identified throughout the Member States’ implementation practices.

1. Relevant provisions of the IED

This analysis focuses on the regulation of large combustion plants in Annex V of IED. However, the same conclusions could be drawn for waste incineration plants (Annex VI of IED). Annex V, part 3, points 9-10 of the IED read as follows:

„9. At the emission limit value level, the values of the 95 % confidence intervals of a single measured result shall not exceed the following percentages of the emission limit values:

<i>Carbon monoxide</i>	<i>10 %</i>
<i>Sulphur dioxide</i>	<i>20 %</i>

¹ See IED, Annex V, Part 3., §§ 9-10 and Annex VI, part 6, para. 1.3 and part 8, para. 1.2.

² I. e. error of measurement - the devices are never 100 % accurate, whether due to human error, physical characteristics of certain materials or technical limitations. Thus, there is always some uncertainty.

³ Technical provisions relating to large combustion plants, see Annex V, Part 3., paras. 9-10.

⁴ Technical provisions relating to waste incineration plants and waste co-incineration plants, see Annex VI, part 6, para. 1.3 and part 8, para. 1.2.

<i>Nitrogen oxides</i>	20 %
<i>Dust</i>	30 %

10. *The validated hourly and daily average values shall be determined from the measured valid hourly average values after having subtracted the value of the confidence interval specified in point 9...*"

To rephrase, point 9 sets the limits of maximum uncertainty of measurement of certain pollutants; the limit is set as a proportion of the emission limit value, statistically expressed as the 95% confidence interval. In point 10 the provision stipulates that the measurement uncertainty *referred to in point 9* should be subtracted from the measured value. **The main interpretational difference** seems to be whether the subtracted value should be the maximum allowed uncertainty (e.g. 30 % for dust) or the real uncertainty of the specific measuring device at a specific time (i.e. any value lower than 30 % for dust). This provision has been copied from the previous directive 2001/80/EC on the limitation of emissions of certain pollutants into the air from large combustion plants (the LCP Directive). The **limits of maximum allowed uncertainty have not changed since 2001**.

2. Two different approaches

Overall, two different approaches to the issue at hand have been identified. Based on their Member State representatives they are hereinafter referred to as the "Czech approach" and "German approach".⁵

The German approach consists in subtracting the real measurement uncertainty, which is any value lower than the maximum allowed uncertainty. In practice, the operators have to periodically (yearly) have their measuring devices verified by an authorised person in order to prove compliance with the maximum allowed uncertainty set by the IED. During this authorised verification the real uncertainty of the device is ascertained. This **real uncertainty is then subtracted** from the measured values of emissions, until the next measuring device verification or calibration. This approach is more accurate and reflects reality more precisely. Besides Germany, this interpretation is applied in Italy and the Netherlands, for example⁶

The Czech approach is based on a strictly textual interpretation of the aforementioned provision. Although the operators are also obliged to carry out periodical measuring device verifications, the data on real measurement uncertainty are irrelevant. National regulations allow the operators to always subtract the maximum allowed uncertainty,⁷ even though in most cases the real uncertainty is significantly lower. This approach causes an underestimation of measured emissions and is less

⁵ These two approaches were also identified by the Irish EPA: see presentation by Mr. Victor Olmos, IEEG meeting 2017, „Differences in the application of IED Confidence Intervals at Waste Incineration and Large Combustion Plants“.

⁶ Ibid.

⁷ In the Czech Republic, a fixed proportion (e.g. 30 % for dust) of the **measured value** is subtracted, instead of a fixed proportion of the **emission limit value**, which would be the case in most Member States. However, in the Czech Republic, if the measured value exceeds the emission limit, a fixed proportion of the emission limit is subtracted. In the rest of the Member States in the „Czech approach group“, the subtracted value is a fixed proportion of the emission limit. This difference is a minor one, especially since in the „borderline cases“, where the source is about to be non-compliant with emission limits, the approach is the same within the whole group of Member States.

favourable to the environment. Besides the Czech Republic, this interpretation is applied in the United Kingdom, Poland, Spain, and France.⁸

The difference between the two main approaches can be demonstrated using the “borderline case” of a fictitious large combustion plant whose **compliance with emission limits depends on the approach used towards measurement uncertainty**. For the purposes of the example, the large combustion plant has an emission **limit of 200 mg/m³ for NO_x** (nitrogen oxides). In this case the plant **measures emissions of NO_x = 230 mg/m³** (the reported value with the uncertainty subtracted). However, in the Czech approach, the operator is entitled to subtract the maximum allowed uncertainty for NO_x, which is 20 % of the emission limit value, i.e. 40 mg/m³. After this is subtracted, the **plant has complied** with the emission limit (the reported value in blue is under 200 mg/m³).

On the other hand, **if the German approach is applied**, the source **might not comply** with the emission limit. If the real uncertainty of the device is e.g. 10 %, only 10 % of the emission limit value, i.e. 20 mg/m³, can be subtracted. In that case the reported value is 210 mg/m³. See Figure 1 below.

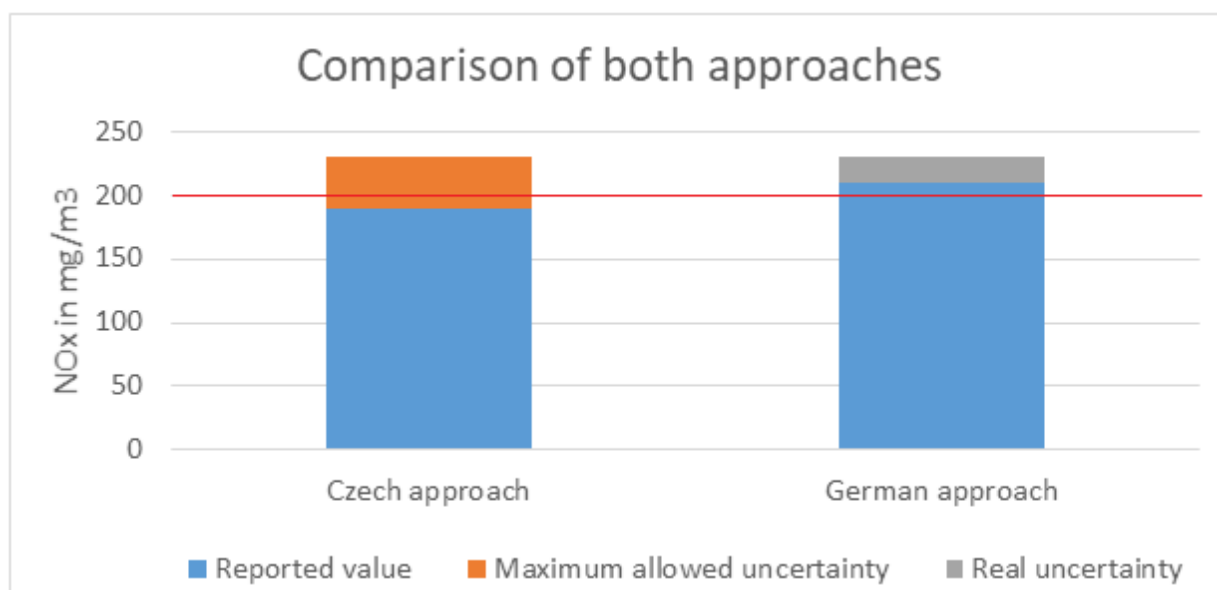


Figure 1: Comparison of both approaches. Source: Frank Bold Society.

The European Commission has already made a statement to the Netherlands on this interpretational difference, in favour of the German approach: “A practice of **deduction of maximum fixed values** regardless of the accuracy of the instrument therefore **does not sit well with the Directive** as the services see it. It would therefore seem that in the case at hand the interpretation given by the national (judicial) authorities [i. e. the Czech approach], although not manifestly wrong in itself, given the room for interpretation which the text of the Directive provides, is not the interpretation which the services would have preferred to ensure the full useful effect of the Directive under all circumstances.”⁹ However, this statement does not seem to have had any impact in changing practices in the “Czech approach”

⁸ Ibid.

⁹ European Commission, 20th July 2017, ENV.E2/MV/ts/CHAP(2016)2410.

group of Member States. No infringement proceedings, guidelines or binding rules have been adopted by the European Commission regarding this matter.

3. National case studies

a) Czech Republic: Počerady lignite power plant

The specific characteristic of the Czech version of this approach is that the IED has been transposed into a national regulation (no. 415/2012 Coll., § 9 sec. 7) in a way that **does not leave any space for any other interpretation**. This is different from other states applying the Czech approach only through methodological guidance.

Elektrárna Počerady¹⁰ (1000 MWe) is a lignite power plant, one of the biggest national and even European polluters.¹¹ The evidence shows that the power plant may have **complied with its emission limits solely because of the Czech approach** to emission uncertainty subtraction.

Based on the IPPC permit compliance report for 2018,¹² the power plant has reported the following NO_x emission values for its units: B2: 194,29 mg/m³, B3: 190,69 mg/m³, B4: 181,02 mg/m³. Thus, all the aforementioned units have complied with the emission limit of 200 mg/m³. However, the measurement uncertainty of 20 % of the emission limit (40 mg/m³) has been subtracted from each value. It means that the raw measured values of NO_x emissions would be: B2: 234,29 mg/m³, B3: 230,69 mg/m³, B4: 221,02 mg/m³.

Data on the real uncertainty of measurement are not available to the public, so it is therefore impossible to recalculate the emissions from Počerady power plant using the German approach. However, assuming that the real measuring uncertainty is somewhat lower than the maximum allowed value, there is a **significant possibility that if the German approach were applied in this case, the power plant would not comply with its emission limit**.

b) Czech Republic: Tušimice power plant

Tušimice lignite power plant (800 MWe) is one of the biggest large combustion plants in the Czech Republic. As seen in the figure below, this power plant (example for unit K22) is able to comply with the BAT Conclusions emission limit for NO_x (175 mg/m³) **despite not installing any new abatement techniques**. The possibility of measurement uncertainty subtraction was introduced to the Czech legal system in 2016. The figure below demonstrates the decrease in reported emissions between

¹⁰ National ID: CZ44746297, E-PRTR profile:

<https://prtr.eea.europa.eu/#/facilitydetails?FacilityID=13898&ReportingYear=2016>

¹¹ Počerady power plant has been listed as one of the Europe's „toxic thirty“ – power plants which have the most adverse impacts on human health.

¹² Reported according to Art. 14/1/d) IED. Available at: [https://www.mzp.cz/ippc/ippc4.nsf/\\$pid/MZPR98EK9492](https://www.mzp.cz/ippc/ippc4.nsf/$pid/MZPR98EK9492).

the years 2015 and 2016 – this decrease was caused solely by subtraction of uncertainty, but real emissions have stayed the same.

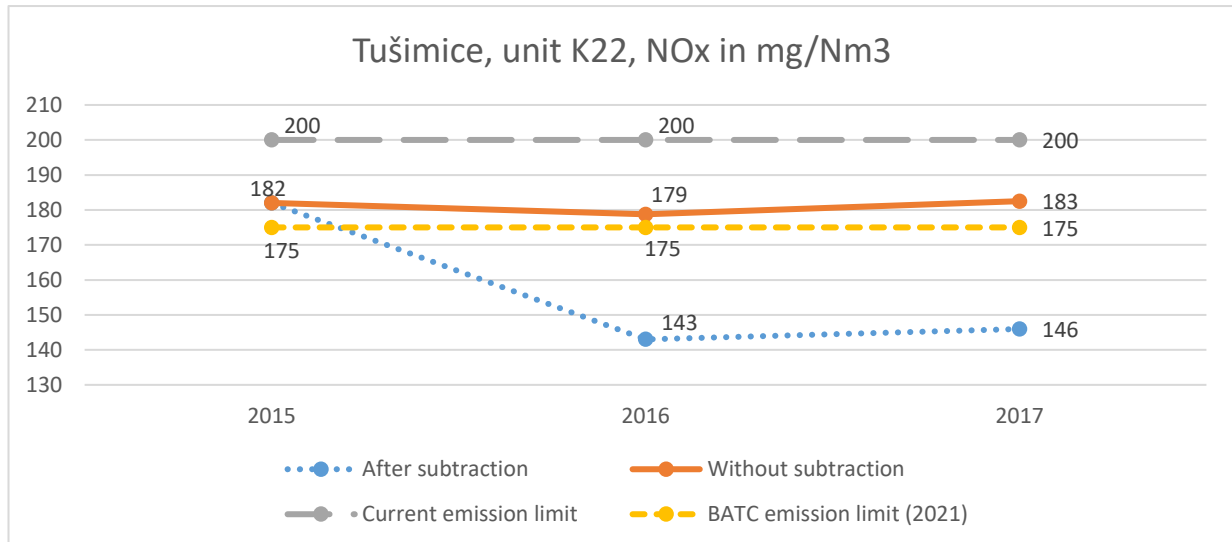


Figure 2: Tušimice power plant. Source: Frank Bold Society, based on IPPC permit compliance reports.¹³

c) The Netherlands: transition in favour of the environment

The Netherlands underwent a **transition from the Czech approach to the German one in 2018 and 2019**. Initially, the government promoted the Czech approach through non-binding guiding documents¹⁴, and this practice was confirmed by an administrative court decision.¹⁵

In response to the information on the official website and the court decision, the ‘Stichting Afvaloven Nee’ (SAN) lodged an official complaint to the European Commission about the interpretation of this article. In response to this complaint, the Head of the Directorate-General for Environment (DGE) of the European Commission sent a reply on July 20th 2017, stating that **the German approach would be preferred**. However, it was not considered necessary to start infringement proceedings against the Netherlands for applying the Czech approach.

In response to the European Commission’s opinion, the Dutch authorities acknowledged that a change to the existing interpretation of the IED was inevitable¹⁶ and preparations began for new guidance to be issued. Following this decision, the Raad van State (Council of State) also upheld the

¹³ Available at:

<https://www.mzp.cz/ippc/ippc4.nsf/%24%24OpenDominoDocument.xsp?documentId=19E6A&action=openDocument>.

¹⁴ See Dutch Ministry of Infrastructure: <https://www.infomil.nl/onderwerpen/lucht-water/stookinstallaties/grote/5-toetsing-eisen/5-1-continue/5-1-2-metingen/#Correctiemeetonzekerheid>.

¹⁵ The decision of 15th of July 2015, ECLI:NL:RVS:2015:2246, available in Dutch:

<https://www.raadvanstate.nl/@100710/201407361-1-a4/>.

¹⁶ See ‘Memo Meetonzekerheid bij continue metingen - Bepaling meetonzekerheid en correctie van gemiddelden’, Platform kwaliteit luchtmetingen, 26th of July 2018.

German approach to measurement uncertainty subtraction and rejected further application of the Czech one.¹⁷

d) Sweden: restricted area of application

In Sweden, the Czech approach to the issue at hand is applied. However, the Swedish interpretation differs from other Member States in other specific aspects (not relating to the Czech or German approach). According to information obtained from the Swedish EPA, **the whole concept of measurement uncertainty subtraction is only applied in cases where emission limits according to the IED, Annexes V and VI apply**. This means that if the IPPC permit sets a specific stricter limit (e.g. due to the application of BAT Conclusions or local environmental conditions), no uncertainty is subtracted from the measured values. This contrasts with the practice of other Member States (e.g. the Czech Republic, Germany, etc.) where measurement uncertainty is subtracted from all emissions measured by continuous measuring systems.

e) Estonia: a reversed calculation

According to information from Estonian authorities, there are no official and formally adopted national guidance documents on these requirements. However, the responsible officer at the Ministry of Environment drafted **unofficial guidance** on the implementation of the measuring requirements found in Annex V of the IED and transposing acts. This methodological guidance is based on a specific example and provides step-by-step explanations on how to interpret the measurement results and determine whether they comply with the emission limit values (ELVs). The guidance has been shared internally with other authorities, although never officially approved.

Based on this (unofficial) guidance, the percentages referred to in the rules are **automatically added to the ELVs** for the purposes of determining compliance of the measurements with the limit values (e.g. in case of NO_x, the validated emissions may not exceed 200 mg/m³ + 20%, i.e. 240 mg/m³). This interpretation is in a way a reverse of the Czech or German approach – instead of subtracting uncertainty from the measured value, the emission limit is increased. In practice, this approach would render similar outcomes to the Czech approach. It does, however, demonstrate that national practices are diverse and lack a uniform interpretation.

f) Hungary: possible regional differences

Based on the information provided by the Hungarian authorities, there is no officially agreed practice. Currently 20 **regional environmental authorities interpret the regulation** according to their own interpretation. The Ministry of Agriculture (*de facto* Ministry of Environment) leaves the task of interpretation to the regional environmental authorities.

¹⁷ The decision of 9th of May 2019, ECLI:NL:RVS:2019:1737, available in Dutch: <https://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:RVS:2019:1737&showbutton=true&keyword=ECLI%3aNL%3aRVS%3a2019%3a1737+>.

g) Greece: interpretation in the hands of operators

According to information provided by the national authorities,¹⁸ interpretation of the IED is left completely in the hands of the operators. The **authorities only receive the reported emission values** after the measurement uncertainty subtraction, and these values are subsequently reported to the EU. There is **no other law or regulation governing this process**, except the ministerial decision transposing the IED (annex V, part 3, paragraphs 9 and 10), which is a direct translation of the IED.

4. Conclusion and key messages

- The issue of measuring uncertainty seems to be the subject of significant differences in interpretation amongst the EU Member States. The preferred interpretation has been identified by the European Commission, but this has not influenced any Member States except for the Netherlands.
- The differing approaches may lead to significantly different outcomes, both from an environmental point of view and from an economic perspective. Different interpretation leads to de facto different standards of environmental protection. Varying operating costs for operators in different countries might also lead to preferential treatment of certain operators in the integrated energy market.
- The analysis shows two main approaches to the issue: the Czech approach (subtracting the maximum allowed uncertainty) and the German approach (subtracting the real uncertainty – preferred by the European Commission).
- Besides the two main approaches, many more differences in application can be found throughout the EU. Some Member States have adopted interpretational guidance, whereas others leave the issue in the hands of regional authorities or even the operators themselves.
- It seems to be an unanswered question whether the concept of measurement uncertainty subtraction should be applied beyond the explicit provisions in the IED – e.g. in other industrial sectors besides large combustion plants and waste incineration, for other pollutants than those explicitly mentioned in Annex V and VI or in cases where BAT conclusions apply.

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¹⁸ Letter from Greek Ministry of Environment from 10th April 2019, in response to request of information from The Green Tank NGO.

Note: research has been carried out in cooperation with NGOs and public authorities from a range of Member States: MOBilisation for the Environment (the Netherlands), The Green Tank (Greece), EMLA (Hungary), Estonian Environmental Law Center (Estonia), Swedish EPA (Sweden).

All the reference documents are available upon request.