

Für Mensch & Umwelt

Umwelt 
Bundesamt

TFEIP Meeting 2025 Combustion & Industry Expert Panel
Mixed C&I issues

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Welcome to the Combustion & Industry Expert Panel 2026!

Agenda

1. 14:15 Welcome
2. Remembering Carlo Trozzi
3. 14:25-15:00 Kristina Juhrich: “Guidebook update: principles, basic questions, completeness, accuracy, regional emission factors, technology-specific emission factors, specific flues gas volume, correlations, technical interrelationship (BAT), plausibility, use of PRTR/ IEP data, ”
4. 15:00-15:20 Erik Honig: “Diffuse PM10 emissions from cracks, holes or open doors in factories”
5. 15:20-15:40 Coffee break
6. 15:40-16:00 Alessandro Marongiu: “Experience in Lombardy in emission estimates from wood-fired pizza ovens”
7. 16:00-17:00 Kristina Juhrich: “Guidebook update: basic areas of improvement, heavy metals, PCBs, fireworks, biofuels, 2D, fugitive emissions, industry, small combustion, **errors, intersections with other EPs**, impossible tasks”
8. 17:00-17:15 Next steps: new co-chair(s), Guidebook revision & other contribution
9. 17:15-17:30 Any other business

Carlo Trozzi



- ***Dinosaur* of the industry & Combustion Expert panel**
- **Carlo was the archive of the combustion & industry Guidebook chapters**
- **Unfortunately there wasn't enough time to save the documents and write down the information he had stored in his head**
- **We have to be pragmatic and should keep all plausible values trying to replace all unplausible/ outdated values**

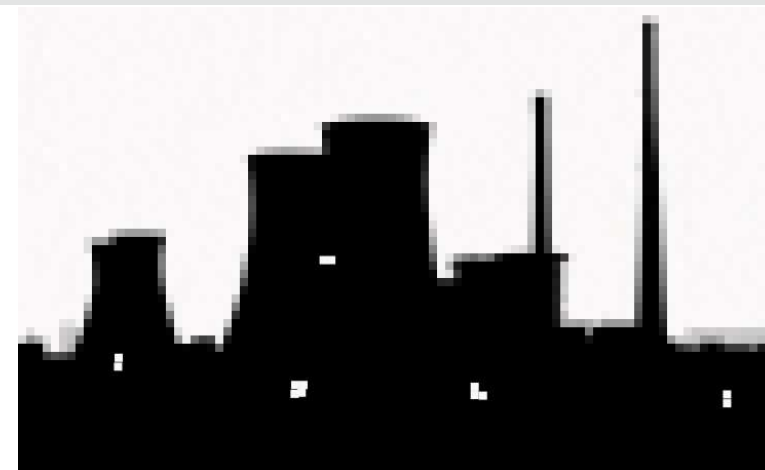
Principles/ basic questions on the Guidebook revision

Combustion & Industry expert panel covers a broad range of Guidebook chapters

Resources are limited  Need for setting priorities

- Which information is essential and has to be updated?
- Which information is not used and can be removed?
- Which is a useful background information (and can be moved to the annexes)?
- Which pollutants are the most important (for each source category)?
- Is it useful to calculate Tier 1 EFs by using Tier 2 EFs describing the assumptions behind? Maybe this is not practical for alle source categories, a Tier 1 has to be somehow conservative (→ a small combustion Tier 1 EF should be derived from conventional stoves).
- Is it necessary to replace plausible/ valid values by data from recent studies?
- **How can we create a user-friendly Guidebook?**

Cross-cutting Guidebook issues
Completeness ↔ **Accuracy**



Is it really necessary to provide a full set of emission factors for all source categories?

Principle proposal: Focusing on the most important pollutants for each process

- **Excepting a heterogeneous structure (within the C&I chapters and compared to other chapters)**
- **Including a new notation key: NR (not relevant)**
- **Stronger link to the BAT conclusions where some pollutants are not considered because they are not relevant (for example heavy metals from natural gas combustion)**
- **Avoidance of implementing EFs which are derived from values below the limit of quantification (LoQ)**

Is it useful to update data which are <LoQ?

Cross-cutting Guidebook issues

Regional versus technology-specific emission factors



- EFs depend mainly on: fuel or other input material which is used, combustion process, production process, abatement techniques (limit values) but not on regions
- The Guidebook should provide representative values for many countries but cannot cover everything: if some specific fuel qualities/ raw materials are connected with a defined region, country-specific EFs should be used
- Some EFs seem to be connected with specific regions (EU) but the reason behind is the use of similar limit values, similar abatement techniques which are defined as Best Available Techniques (BAT) (**improvement list: high priority**)
- In several cases the year of manufacture is also a factor (new plant ↔ old plant)
- Proposal: provision of technology-specific emission factors including a brief description of (fuel/ raw material, combustion-/ abatement technique)

Cross-cutting Guidebook issues specific flue gas volume (improvement list: nice to have)

- Opportunity for using country-specific limit values giving a strong link to legislation and projections
- Useful for all combustion chapters, quite difficult to get reliable data for industrial processes

fuel	NCV [kg/MJ]	O ₂ content	specific flue gas volume [m ³ /GJ]	data source
light fuel oil	42,9	3%	289	BAFU 2015
heavy fuel oil	40,7	3%	304	Saake Faustformeln
Hydrogen	10,8	3%	202	Beckmann at al 2023
natural gas	36,3	3%	276	Beckmann at al 2023
natural gas	36,3	15%	827	Beckmann at al 2023
natural gas	36,3	5%	310	Beckmann at al 2023
natural gas	36,3	8%	382	Beckmann at al 2023
wood	14,6	3%	658	BAFU 2015
hard coal		6%	362	UBA 2021

Example for calculating EFs by using limit values
 $100 \text{ mg/m}^3 \text{ (limit value)} * 276 \text{ m}^3/\text{GJ} / 1000 = 27.6 \text{ g/GJ}$

Cross-cutting Guidebook issues

Technique-specific emission factors



Technique-specific NO_x emission factors for gas turbines:

year	abatement technique	limit value [mg/m ³]	emission factor [g/GJ]	data source
1980	diffusion burner	250 - 300	207 - 248	expert judgement
1990	premix operation	100	83	expert judgement
2000	premix operation	50	41	IED Part III, Annex V
2010	premix operation	30	25	LCP BAT-conclusions
2010	premix operation + SCR	10	8	LCP BAT-conclusions

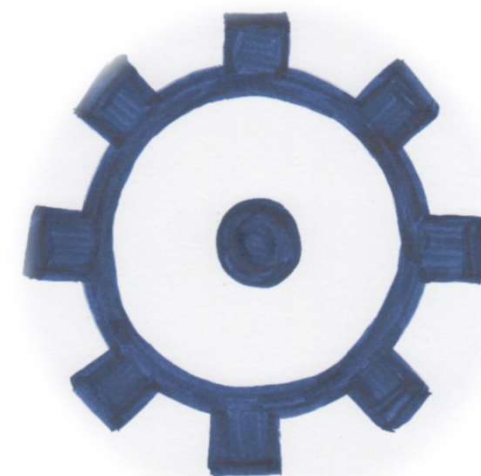
(fuel: natural gas, reference oxygen content: 15%, specific flue gas volume: 276 m³/ GJ)

Such an approach could be useful for developing time series.

Cross-cutting Guidebook issues correlations, technical interrelationship & plausibility

Especially relevant for:

- CO & VOC/ CH₄/ NMVOC in combustion processes
- POPs: correlation between CO & PAH
- Particle-bounded HMs & TSP/ PM10/ PM2.5
- Use of a Flue gas desulfurization: SO₂ ↘ & Hg ↘
- Use of a Selective catalytic reduction (SCR): NO_x ↘, NH₃ ↗
- Is the order of magnitude/ share of the national totals plausible?



Before implementing new EFs correlations, technical interrelationship and the plausibility should be checked



Cross-cutting Guidebook issues Guidance on the use of PRTR/IEP data

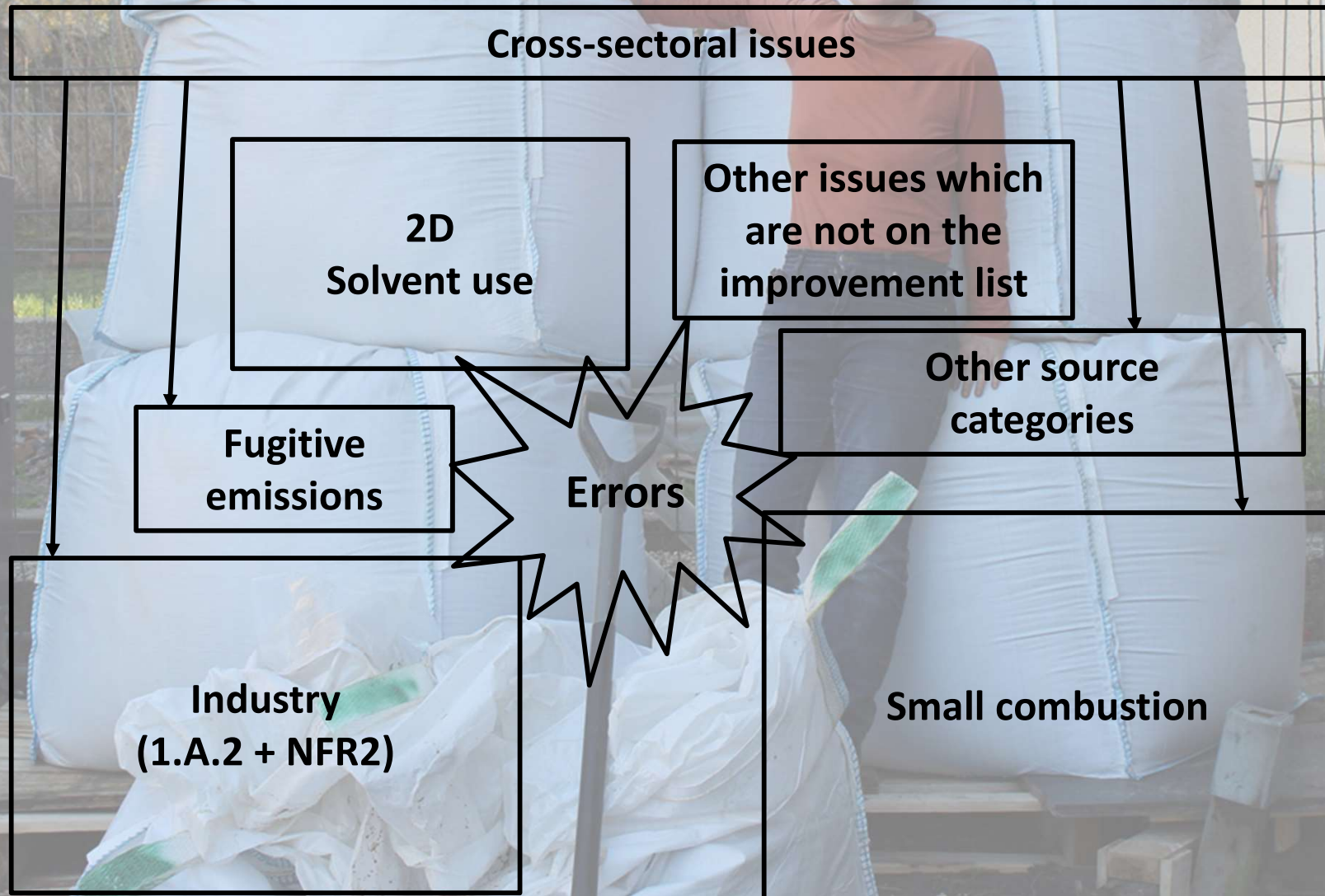
- **Flagged as a high priority issue, not only relevant for the C&I chapters: is it better to provide a general Guidance somewhere in the main chapters or should we provide a source-specific Guidance?**
- **Changing from PRTR to IEP has a relevant influence on the usability: the change from facility to installation level will create smaller units but the thresholds for the main pollutants remain unchanged (NO_x: 100 000 kg, SO₂: 150 000 kg)**
- **The PM10 threshold of 10 000 kg is very high and PM10 is not measured and not regulated. Is it reasonable to use PRTR data which are calculated by the operators using (unknown) default values? How to use PRTR data with a low coverage?**
- **The Key question is the intersection with other inventory data: how to avoid underestimation or double counting?**

Feedback required: Examples to define good practice!

Coffee break

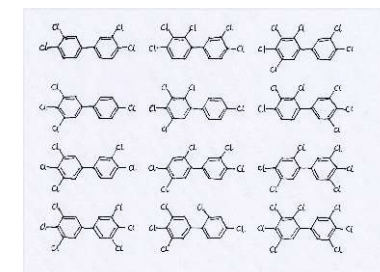


Overview: need for improvement



Specific improvements which are addressed but not yet solved

- **2D3i Fireworks: TSP/PM/HM (improvement list: nice to have)**
checking the consistency
- **PCBs improving documentation on the measurement method**
it cannot be expected that all information is available → necessary assumptions based on the order of magnitude **(improvement list: high priority)**
- **Changing heavy metal EFs for coal (improvement list: medium priority)**
checking time series consistency/ plausibility for unabated flue gas
direct EFs for Hg and Se, different EFs depending on the use of Flue gas desulfurization
indirect EFs for particle bounded HMs expressed as % of TSP, different EFs depending on the use of a secondary dust abatement system
(considering that HMs accumulate in the fly ash)



Key questions for sector-specific improvements

1.A.1.a biofuels

1.A.1.a biofuels (**improvement list: high priority**)

- which biofuels are currently used in large combustion plants?
- which biofuels are currently used in medium combustion plants?
- Which biofuels will be relevant in the next few years?
- Which biofuels are mainly used in co-incineration plants?
- Where should we allocate medium combustion plants to 1.A.1.a or 1.A.4?
- Which Pollutants are relevant?

Clear definition of Biogas and Biomethane!

improvements needed in the fugitive sector

1.B (improvement list: low priority, nice to have)

- some data are outdated/ not appropriate
- Incorrect documentation
- Distinction between underground and surface mines
- Differentiation of different coal types
- Better description of different production methods
- Allocation of charcoal and biochar production
- Method for coal gasification is missing
- 1.B.2.av is not mentioned (update in 2023): improving description of abatement measures, including a flow chart could be useful



Fixing this issues could create a sustainable, stable chapter.



2.D: major areas where a need for revision is identified

2.D: all chapters (**improvement list: high priority**)

- Solvent use:
 - NMVOC EFs have to be updated
 - Correction of errors
 - implementation of information from TFTEI and latest BREF documents
 - Guidance on how to use ESIG data
 - Review of PRODCOM codes
 - Development of a Tier 1 methodology based on assumption (x% deco paint, y% industrial paint, z% other paint)
 - Development of a Tier 1.5 and Tier 2 method
- Tobacco
- fireworks
- lubricants
- Leather finishing/ boat building
- Glass and mineral wool coating
- Asphalt plants

Key questions for sector-specific improvements industry

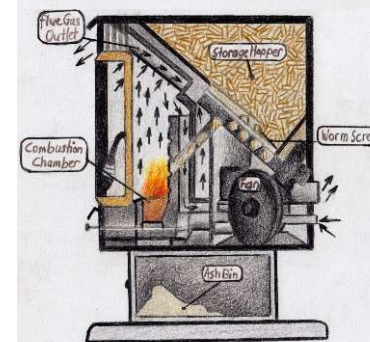
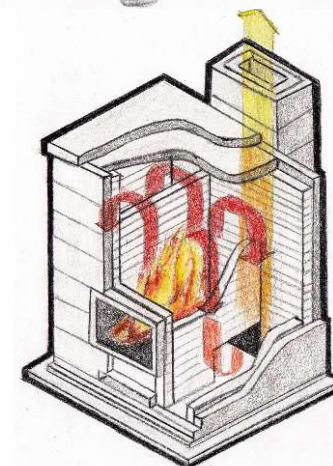
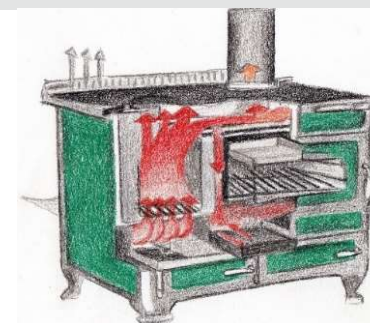
- **What is a good solution for the allocation between 1.A.2 and NFR2? We need sector-specific and pollutant-specific solutions and a clear documentation. Maybe helpful to present a summary table at the beginning of the 1.A.2 chapter?**
- **How can we avoid double-counting or underestimation?**
- **Some EFs in 1.A.2 are too high (derived from small or medium combustion plants). Which fuel-specific EFs could be appropriate for the industry?**
- **How can we connect Tier 1 and Tier 2 EFs?**
- **How can we get a stronger link to the BAT conclusions (technique-Specific EFs including a description of abatement techniques)?**
- **How can we improve the iron & steel chapters?**

Key questions for sector-specific improvements: small combustion

- Is it better to change the chapter completely or better to realize a step by step approach? (Firstly improve Tier 1 and Tier 2 emission factors bevor developing a Tier 3 method?)

The chapter is very comprehensive:

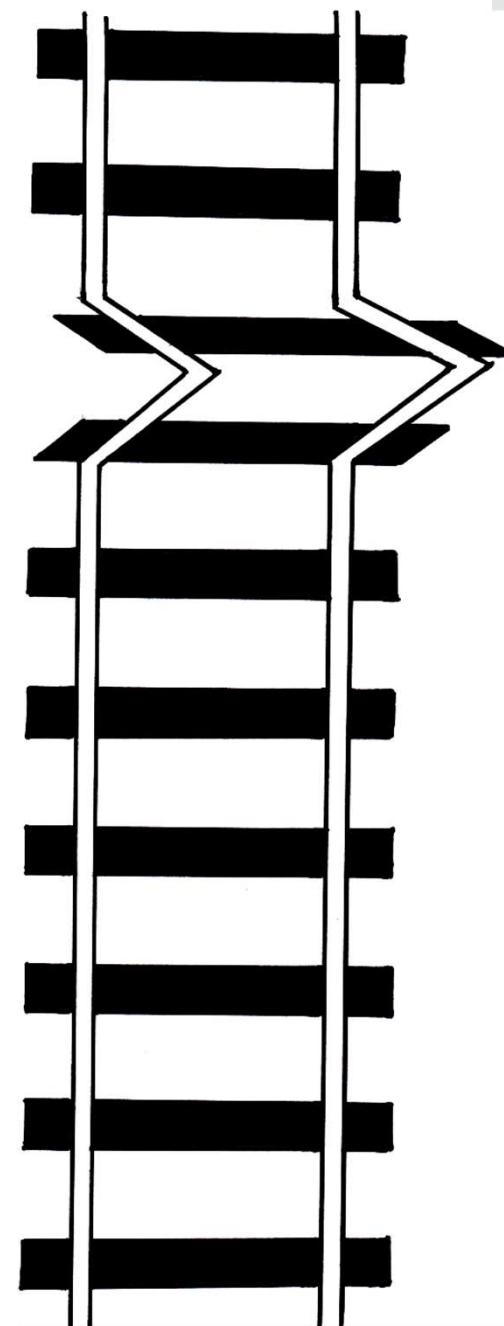
- Which information is useful and has to be updated?
- Which information is not used?
- Which information is a useful background-information which can be published separately in the annexes?
- How can we get the connection between the technology-specific descriptions and the default emission factors?

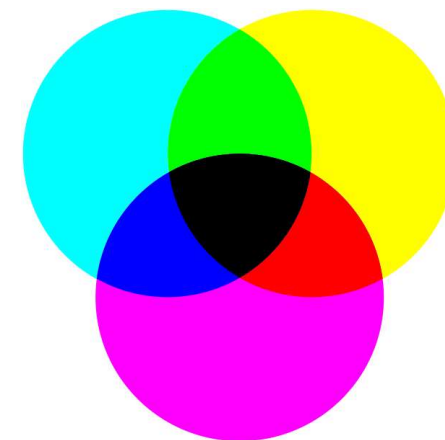


Errors

Although not all errors are identified as issues with a high priority they should be solved as soon as possible.

- General issue is the missing **reference to primary literature** in several cases
 - Reference to older Guidebook versions (original source cannot be found)
 - Reference to studies which do not contain the values
 - Reference to national IIR versions which are not available any more
- Some Emission Factors are too high
- Other incorrect values
- Technique is not used any more
- Fuel quality changed (inconsistency with current regulation)
- Values and descriptions are inconsistent
- Inconsistency between Tier 1 and Tier 2
- Several outdated annexes





Intersections with other Expert Panels

- praxis of citation: References to personal communications, unpublished reports or expert judgment: **relevant for all expert panels**
- Definition of (NM)VOC: **relevant for all expert panels**
- Use of PRTR (IEP) data: **Waste, Agriculture (?), User engagement (?)**
- Biofuels: **Transport, Waste, Agriculture**
- Production of biochar: **Agriculture (?)**
- Update of Organic carbon emission factors: **User engagement**
- chemical speciation for VOC and PM: **User engagement**
- HM emission factors of gas oil: **Transport (consistency with diesel)**
- 1.A.3.e compressor stations: **Transport**
- Identification of emission factors for new manufacturing processes, fuels or conversion technologies: **Projections**

Impossible tasks...

133	All	<p>There are a number of editorial issues which need to address relating to the C&I sector and to reduce the list of recommendations in the C&I sector, all the editorial issues have been grouped into one issue/row. The majority of these editorial issues relate to incorrect references</p>	<p>Check and update all incorrect references make the relevant editorial changes</p>
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Some suggestions for improvement are non-solvable

→ an only documentation in the improvement list does not go far enough

Provision of a completed-tasks-list which reflects all the work that has been done.

Wanted



New co-chair(s):

- **Who is enthusiastic and able to invest time as a co-chair?**
- **Who isn't afraid of big problems and stays in good moods?**
- **Please contact me if you are interested!**

Other contribution:

- **Who is motivated to support me updating the Guidebook?**
- **It's possible to choose little parts of the long list – every assistance is helpful!**
- **Other support like raising funds or putting a project to tender?**
- **Please contact me if you are interested!**