TFEIP TASK FORCE ON EMISSION INVENTORIES & PROJECTIONS

EXPERT PANEL COMBUSTION & INDUSTRY

Small combustion chapter updates | Jeroen Kuenen

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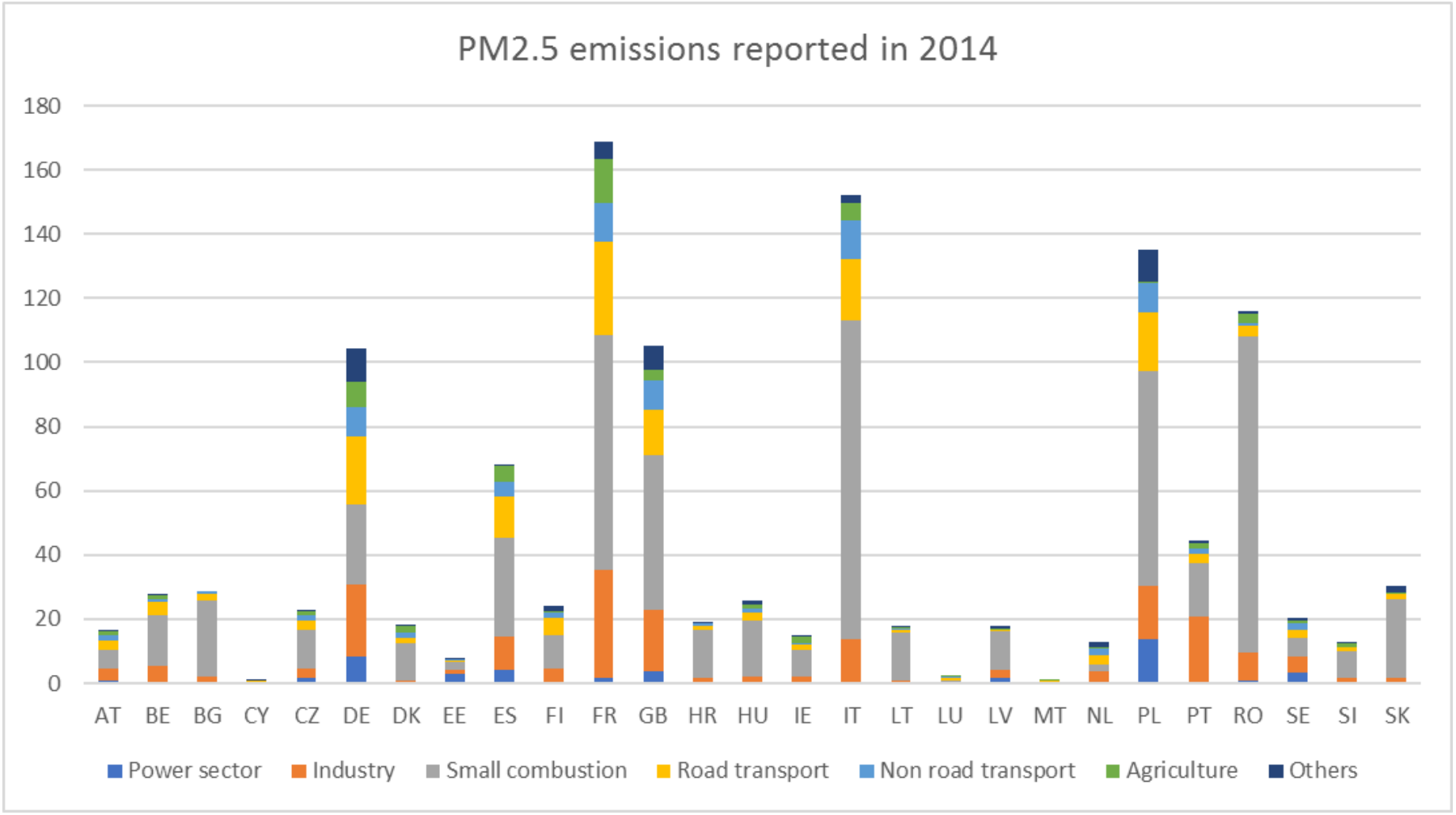
TNO innovation for life

WHY SMALL COMBUSTION ?



WHY (AGAIN) SMALL COMBUSTION ?

- Small combustion becomes more and more important, given reduction of emissions in most other sectors
- Yet, the emission estimates remain uncertain due to various reasons:
  - Activity data
  - Appliance type
  - Burning practices (wet/dry wood, how it is loaded, etc.)
  - Emission factor basis (condensables or not)

- Discussion around condensables is very relevant for small combustion, in particular for biomass

PM REPORTING BASIS

- Last year the TFEIP discussed the topic of condensables, and a sector-specific approach was adopted
- This implies that on a sector basis we decide whether or not condensables are to be included in the PM emission factors
  - Road transport: yes
  - Energy and manufacturing industry: no
  - Small combustion: ???

- **This year we will need to decide on whether or not we propose to include condensable component in emission inventories**

QUESTIONS TO EVERYONE

- Mainly for countries using the Guidebook for small combustion
  - What are your experiences with the updated methodology?
  - Who is still using Tier 1?
- Emission factors are there for the key technologies. Information on technology split is provided for PM from biomass if you don't have any country specific data yourself.
- What can we do to help you further?

CONDENSABLES

- 2016: joint workshop TFEIP-TFMM where modellers stressed the need to achieve consistent & complete information from the inventories
- Current reporting is a mix of countries reporting on a basis including / excluding condensables

INTRODUCTION

- the US EPA defines particulate matter (PM) as consisting of a filterable fraction (FPM) and a condensable fraction (CPM).

Filterable PM is directly emitted:
- Solid or liquid
- Captured on filter
- PM_{10} or $PM_{2.5}$

Condensable PM is in vapor:
- Reacts upon cooling and dilution
- Forms solid or liquid particle
- Always $PM_{2.5}$ or less

where should the PM mass be that forms almost instantaneously?

Emission inventory compilers work source by source, compiling the best Emission factor by source but do not compare across sources

INFLUENCE AND IMPORTANCE OF SAMPLING AND MEASUREMENT TECHNIQUES ON EMISSION

- **Industrial stack PM emissions** are defined as particulates (aerosols) that are present in waste- or flue gas streams and not the condensable gases in these streams. Condensable particulate matter is by definition excluded
- **Road transport exhaust PM emissions** by definition capture most of the condensable PM because measurements include dilution and cooling to 51 ^{o}C.
- **For residential combustion** stoves various methods circulate which capture the condensable PM in various degrees (from 0-100%)

- **How should AQ modellers know about this, when the inventory compilers don't even know…..**

TFEIP'S APPROACH TO THIS ISSUE

- A uniform approach would be the best from a user perspective
- However, this would require currently used measurement techniques to be changed across Europe
  - Road transport: all measurement cycles include condensables
  - Industrial: all stack measurements exclude condesnables

- As a solution, it was agreed in Krakow (2017) that we will adopt a sector-specific approach for including condensables or not
  - Road transport: PM includes condensables
  - Industrial stack measurements: PM excludes condensables

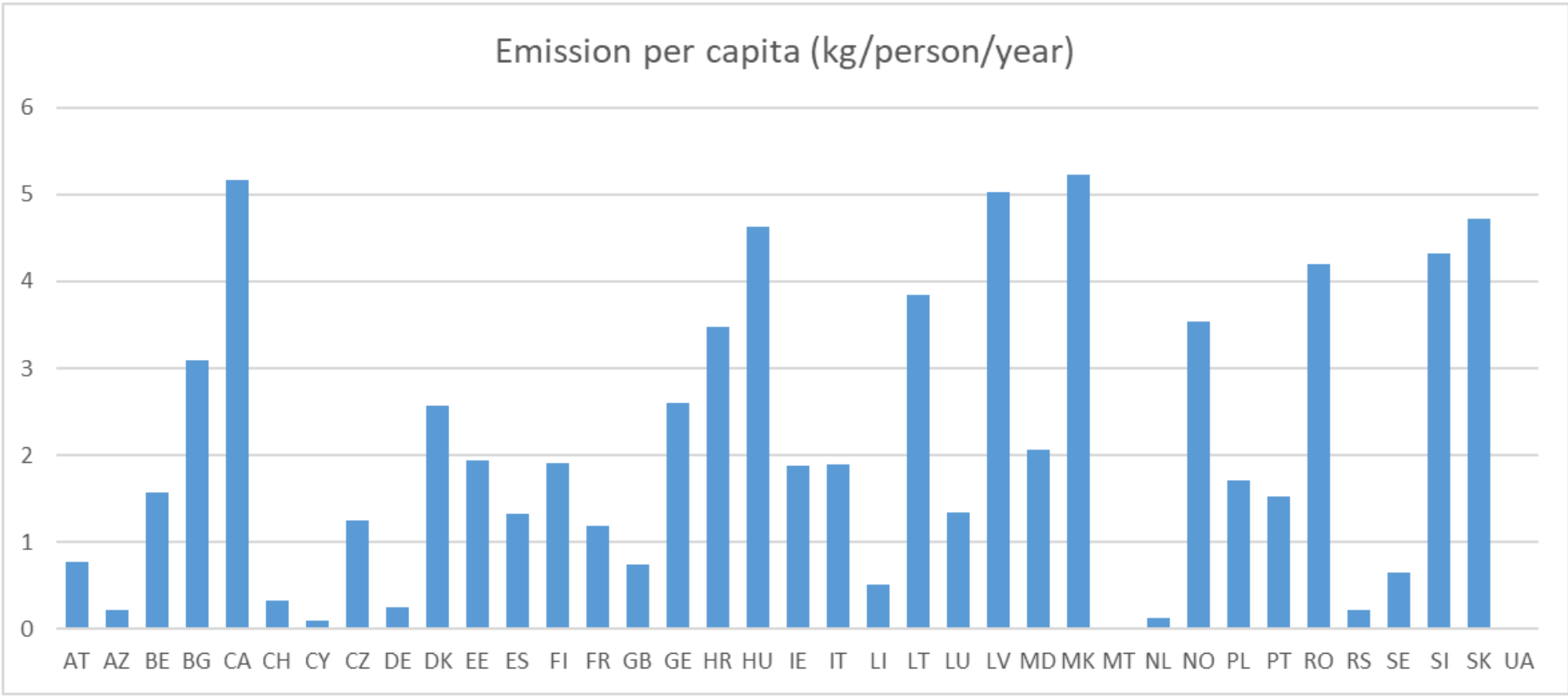
WHY NOT INCLUDING CONDENSABLES?

- It's not formed instantly in the combustion process, but rather a little bit later upon dilution and cooling of the hot flue gases
- PM emissions for some countries could strongly increase which might be hard to explain
- Including condensable component might create problems for some countries to meet the ceilings

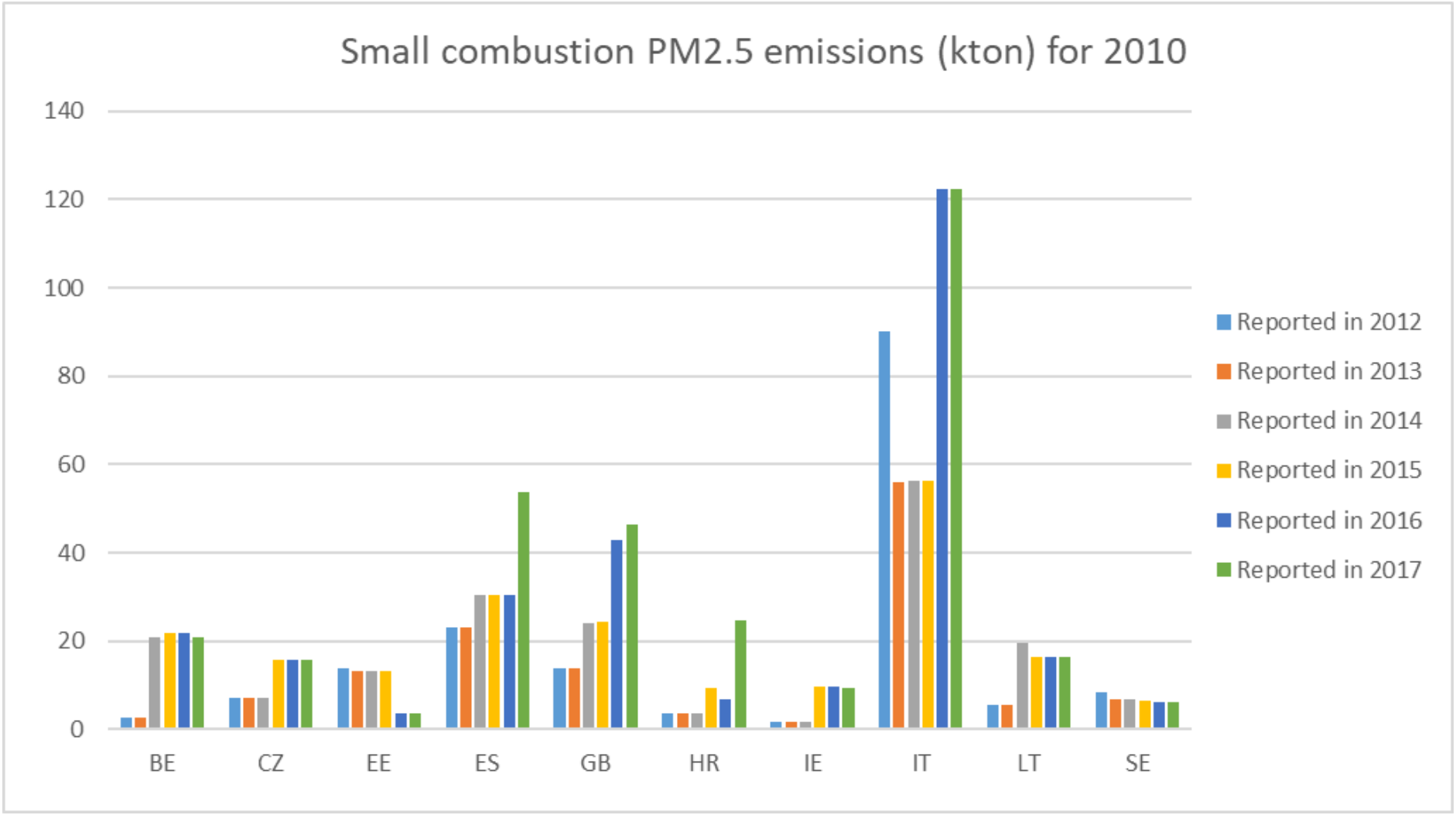
WHY INCLUDING CONDENSABLES?

- The combination of appliance type (fire place, pellet stove, boiler) and amount of solid fuel (wood, coal) determines how much PM_condensable is emitted. Using one overall *"fudge factor"* will give bad results. The information on appliance type and activity data can only come from the inventory community.
- If not present in the EI, any analysis on dominant sources gives misleading information, leading to non cost-efficient measures e.g. when complying with NEC.
- In transport EFs PM_condensable is already (mostly) included –because the cooling goes to 51^{o} · This is not quite ambient ;-) …. Especially during wintertime some will still be missing, but the bulk is captured.
- It is inconsistent and confusing if some anthropogenic sources are dealt with by modellers others by inventories
- RWC is not the only, nor the last source with PM_cond….a quick fix now by asking modellers to modify reported emissions leads to parallel diverging universes…

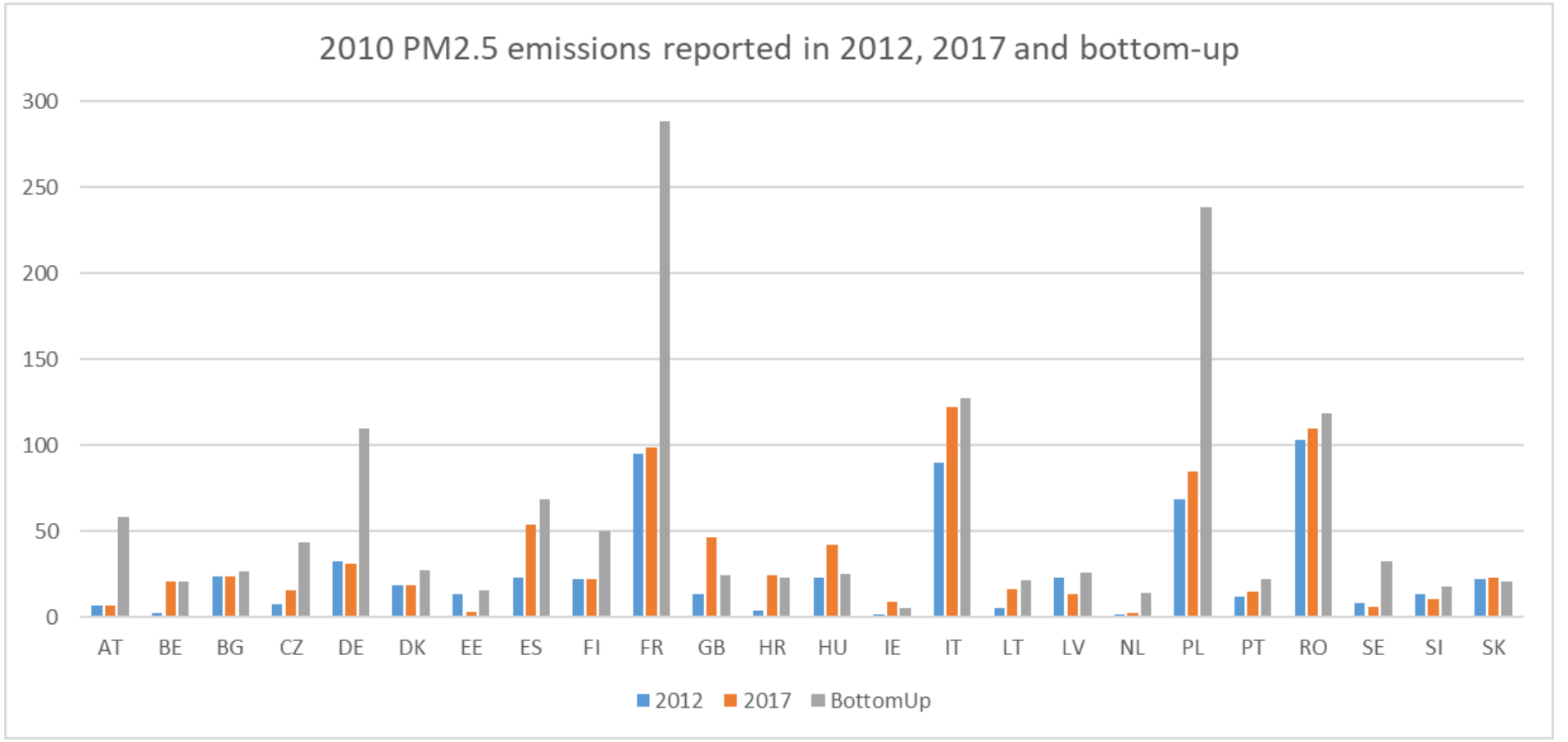
WHAT ARE WE DOING NOW?



SOME COUNTRIES HAVE CHANGED



EU-28 PER COUNTRY



FOLLOW-UP ACTIONS

- Depending on the decision, the Guidebook needs to be reflected in this way to avoid confusion
  - Include only EFs including / excluding condensables
  - Review corresponding guidance in the text

PROPOSAL

- Move towards reporting **including condensable component** to ensure that our emissions represent the complete range of PM emissions
  - If we don't do this, users will still have to "guess" what the non-filterable part is (it depends strongly on technology split)
  - Small combustion is thé key source where the condensable issue plays, in industry this issue is much smaller
  - Number of countries already made the step in last years
  - Compliance issues can be solved by adjustments


THANK YOU FOR YOUR ATTENTION
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