Condensables: Progress in activities in 2021 and future work

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Reporting condensable component of PM emissions

- 23 Parties reported information on the inclusion of the condensable component in PM emissions
- However, often this information
  - is not entirely clear
  - or the Party indicated that the condensable component is partly included
  - or the Party indicated that the status of inclusion is unclear
- available information has been improving (slowly) over years
- especially since the update of the EEA Guidebook 2019, where now for many emission factors it is stated clearly if the condensable component is included in the PM emission factors

Handling the condensable component in the gridded data-set for residential heating

- Workshop on condensable organics organised by MSC-W in March 2020
- Conclusions from the workshop handling the condensable component in emission datasets
  - https://emep.int/publ/reports/2020/emep_mscw_technical_report_4_2020.pdf
  - In year 1 the TNO Ref2 data is used in an initial estimate for residential combustion emissions
  - In subsequent years these top-down estimates should be increasingly replaced by national estimates

Handling the condensable component in the gridded data-set in 2021

- TNO provided a list with Parties where the IEFs (implied emission factors, based on emissions and activity data reported by Parties) suggest that the condensable component was included in PM emissions to CEIP
- CEIP checked for those Parties in the IIRs if the Party confirmed that the condensable component was included in the PM emissions
- If the Party did not provide information or the information was unclear CEIP contacted those Parties beginning of May to ask for confirmation that the condensable component was included in the dataset
- If the Party confirmed that the condensable component was included in emission estimates for the residential combustion emissions the **data reported by Parties was used, otherwise TNO Ref2 emissions were used** like last year
- Aim to use as much data reported by Parties as possible and at the same time ensure a consistent dataset for the EMEP models

Data source for PM emission in GNFR C used in EMEP models in 2021

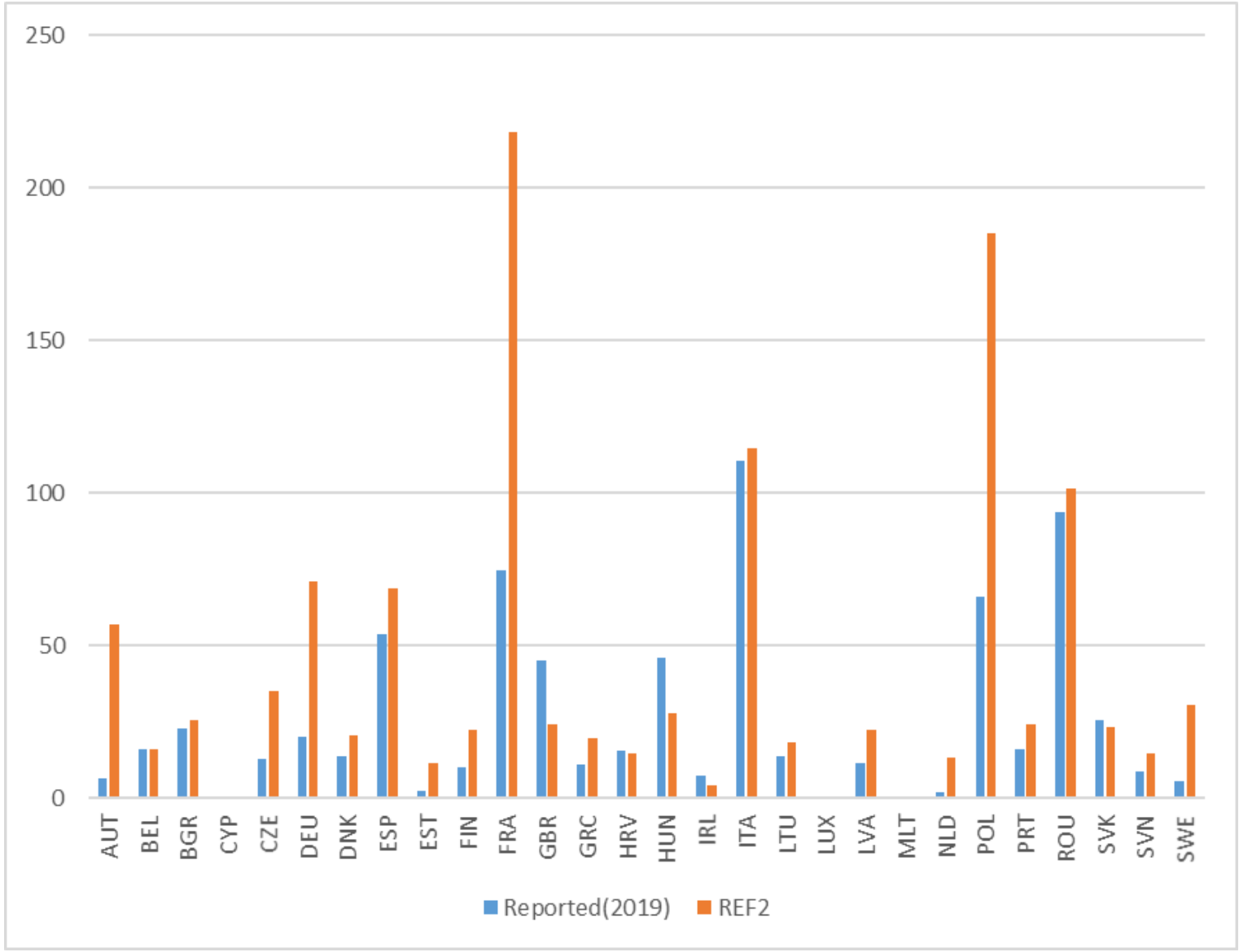
Reported: 26 Parties Ref 2: 17 Parties Gap-filled: 5 Parties

Party	Data source for PM emission in GNFR C	Party	Data source for PM emission in GNFR C	Party	Data source for PM emission in GNFR C	Party	Data source for PM emission in GNFR C
Albania	Ref2	Denmark	CEIP, reported	Italy	CEIP, reported	Netherlands	CEIP, reported
Armenia	CEIP, gap-filled	Estonia	Ref2	Kyrgyzstan	CEIP, gap-filled	Norway	CEIP, reported
Austria	Ref2	Spain	CEIP, reported	Kazakhstan	CEIP, gap-filled	Poland	Ref2
Azerbaijan	CEIP, gap-filled	Finland	CEIP, reported	Liechtenstein	CEIP, reported	Portugal	CEIP, reported
Belgium	CEIP, reported	France	Ref2	Lithuania	Ref2	Romania	CEIP, reported
Bosnia & Herzegovina	Ref2	United Kingdom	CEIP, reported	Luxembourg	CEIP, reported	Serbia	CEIP, reported
Bulgaria	CEIP, reported	Georgia	CEIP, gap-filled	Latvia	CEIP, reported	Russian Federation	Ref2 + CEIP (gap-filled)
Belarus	Ref2	Greece	CEIP, reported	Monaco	CEIP, reported	Sweden	CEIP, reported
Switzerland	Ref2	Croatia	CEIP, reported	Republic of Moldova	CEIP, reported	Slovenia	CEIP, reported
Cyprus	Ref2	Hungary	CEIP, reported	Montenegro	Ref2	Slovakia	Ref2
Czechia	CEIP, reported	Ireland	Ref2	North Macedonia	CEIP, reported	Turkey	Ref2
Germany	Ref2	Iceland	CEIP, reported	Malta	CEIP, reported	Ukraine	Ref2

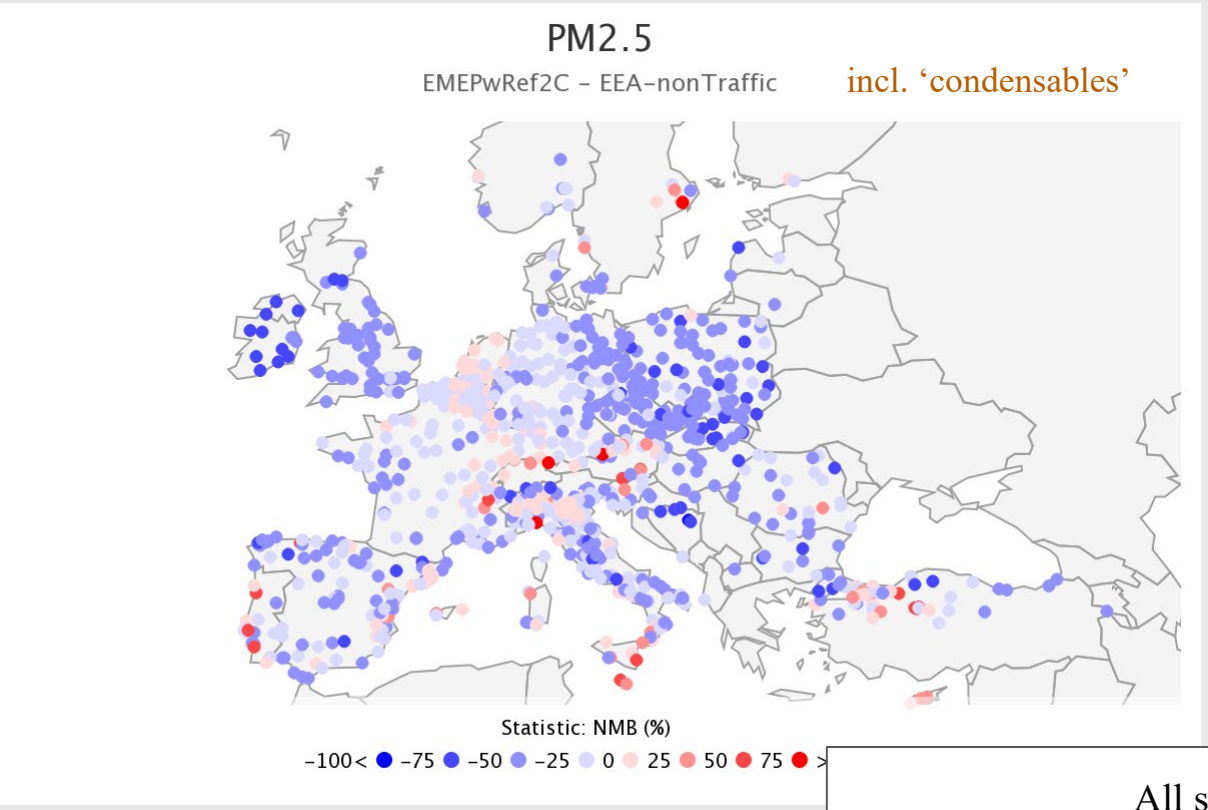
WHAT IS REF2 ?

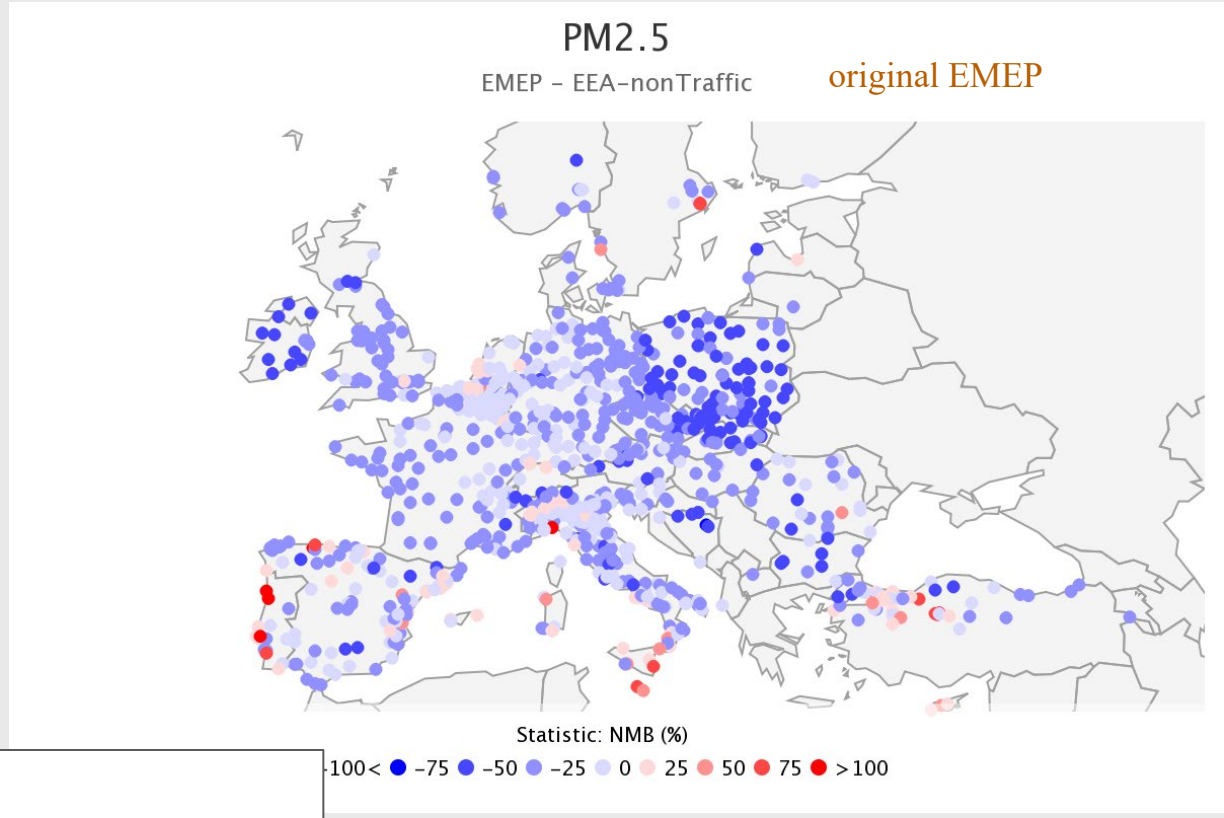
- Alternative inventory (Ref2) developed for Europe, **consistently including condensables for small combustion**
  - Independent from inventory data from countries
  - Fuel statistics, combined with appliance type split (GAINS/CIAM) and emission factors based on the dilution tunnel approach
  - Following methodology in [Denier van der Gon et al., ACP, 2015]

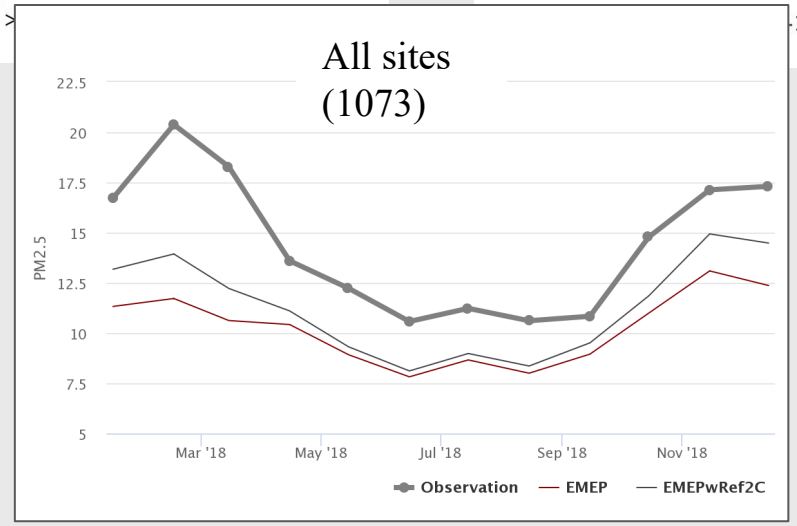
$PM_{2.5}$ emissions for 2015 (kton) from small combustion (GNFR C)



The effect of 'condensables' on $PM_{2.5}$: Comparison to observations (EEA non-traffic)



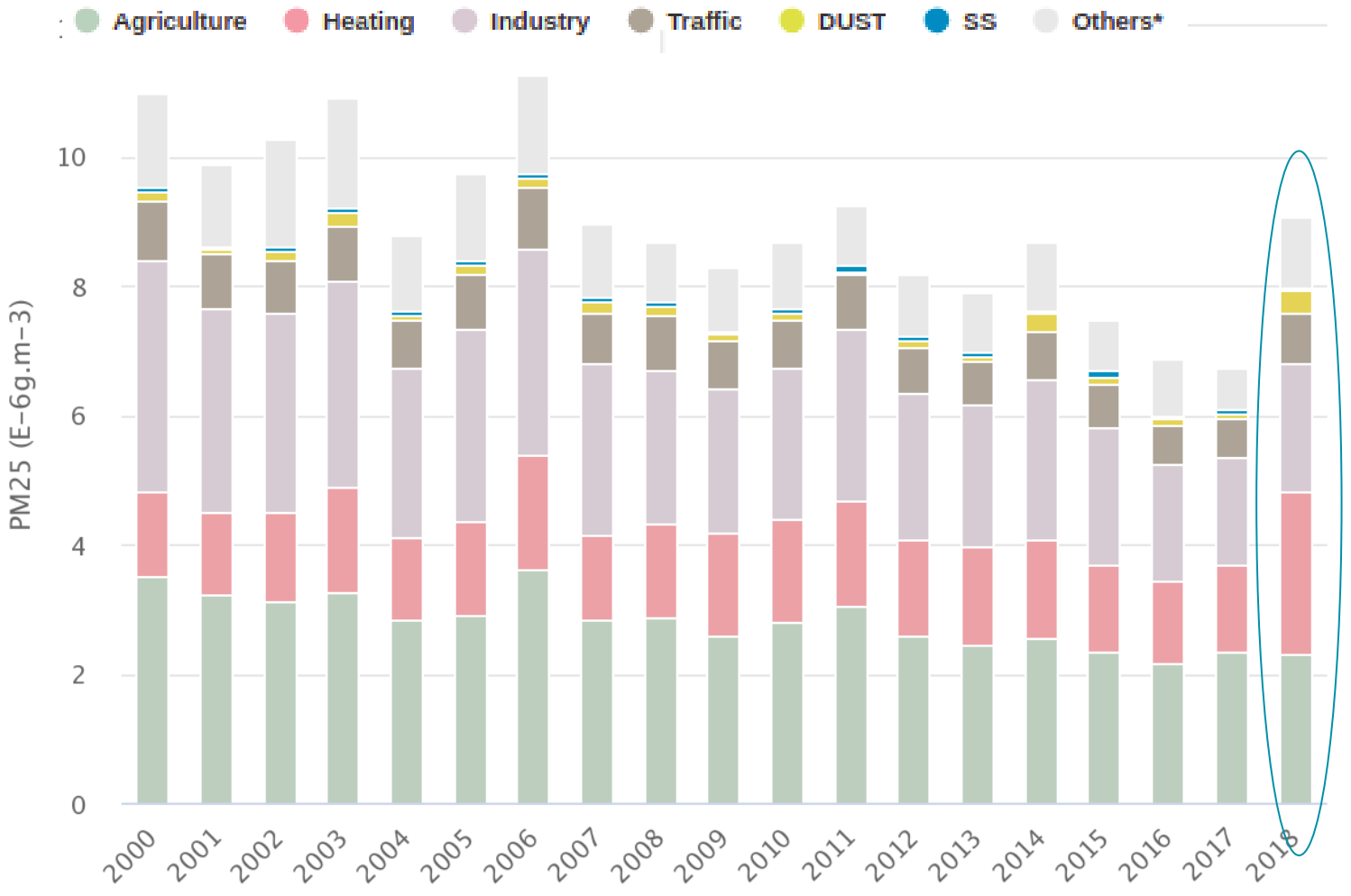




Results for 2018

Norwegian Meteorological Institute

‘Condensables’ impact the relative importance of different emission sectors

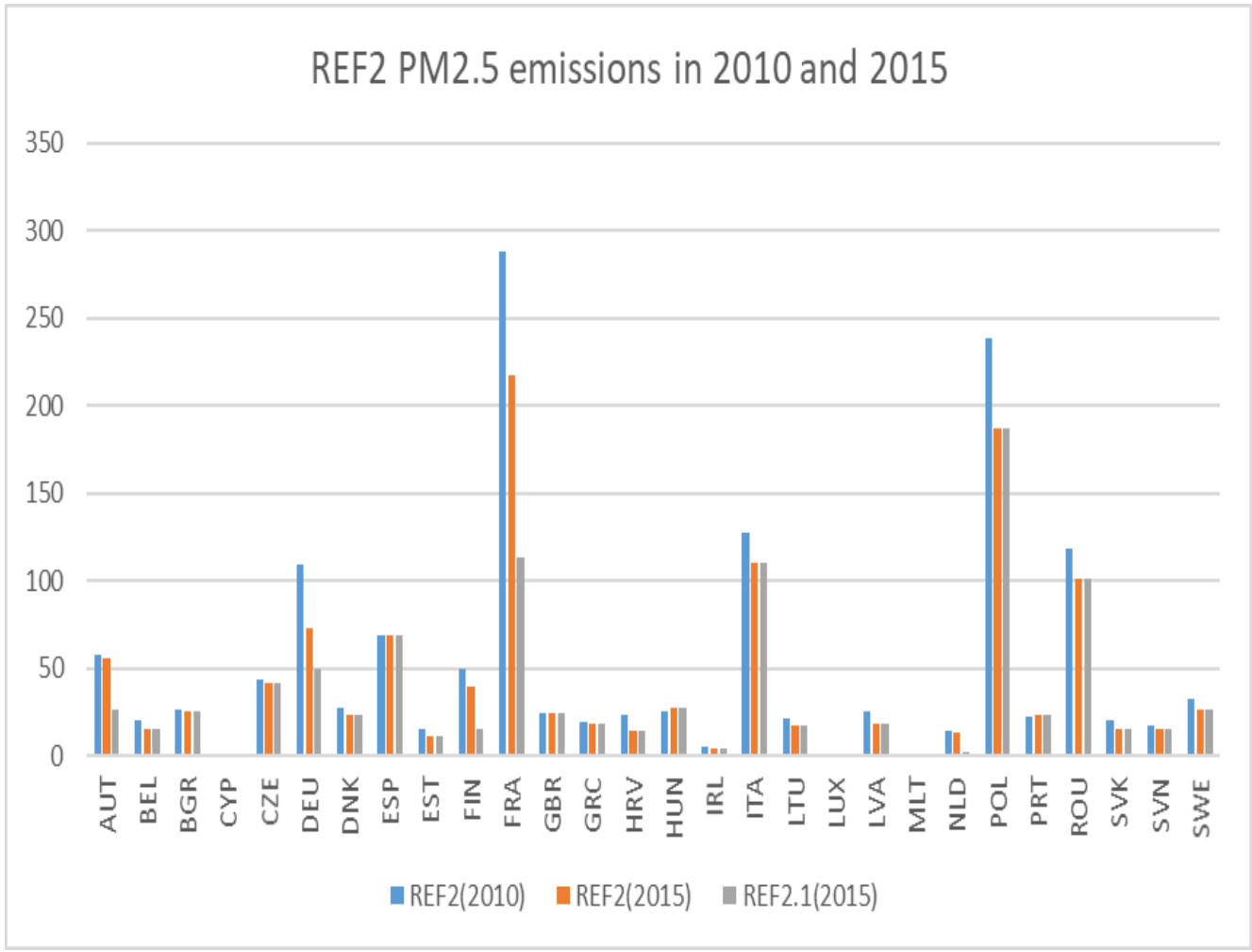


Trend 2000-2018:
2018 calculated ‘with condensables’, 2000-2017 without.

Modelled contributions from different sectors to $PM_{2.5}$, Poland. Increased importance of residential heating when including condensable organics.

WORK IN 2021

- Original Ref2 for 2010 only, scaled towards 2015
- Early 2021, an update for **Ref2 for 2015 was made ("Ref2.1") for 5 countries (AUT, DEU, FIN, FRA, NLD)** based on new information received
  - Emissions reduced due to redistribution of stove types (higher share of more advanced stoves)
  - Ref2.1 (2015) used for EMEP modelling in 2021
- **Next step:** NMR project aims to use this approach for ALL countries, and also to produce time series (2005-2018/19)



NMR-RWC PROJECT: UPDATING REF2 INVENTORY

- ***Revise historical PM2.5 emissions from residential combustion to consistently include condensable organic compounds (CPMs) and assess the implication for the review of Gothenburg Protocol***

- The TNO 'Ref2' emission inventory, which includes condensable PMs will be revised:
  - revision of activity data, stove type distributions as well as emission factors
  - a full time series 2005-2018/19 is foreseen (instead of only single year 2010)
  - provide consistent small-combustion emissions
  - separate solids/condensable PMs in PM
  - fractions of biofuels
  - evaluated/improved against data from NordicWelfAir and IIASA
- The EMEP model will be used to calculate revised fields of PM 2.5 across Europe, evaluated against long-term data, and to provide new source-receptor matrices. The implications of these results for the review of the Gothenburg Protocol will be assessed.
- Project funded by Nordic Council of Ministers
- Participants: MET Norway, TNO (NL), IIASA/CIAM (AT), SYKE (FI), NILU (NO)

CONCLUSIONS

- Including a revised (Ref2) estimate is additional work, but is needed given the improvement of the comparison between modelled and measured PM concentrations

- For a significant number of Parties, the PM emissions (for small combustion only) used in the assessments are not based on their national emission inventory submissions

- Parties need to be aware of the implications (e.g. changes in source apportionment, impact on policies and measures, etc.)