

Für Mensch & Umwelt

Umwelt 
Bundesamt

TFEIP/ EIONET meeting Ghent 2014

The challenges of estimating Mercury emissions

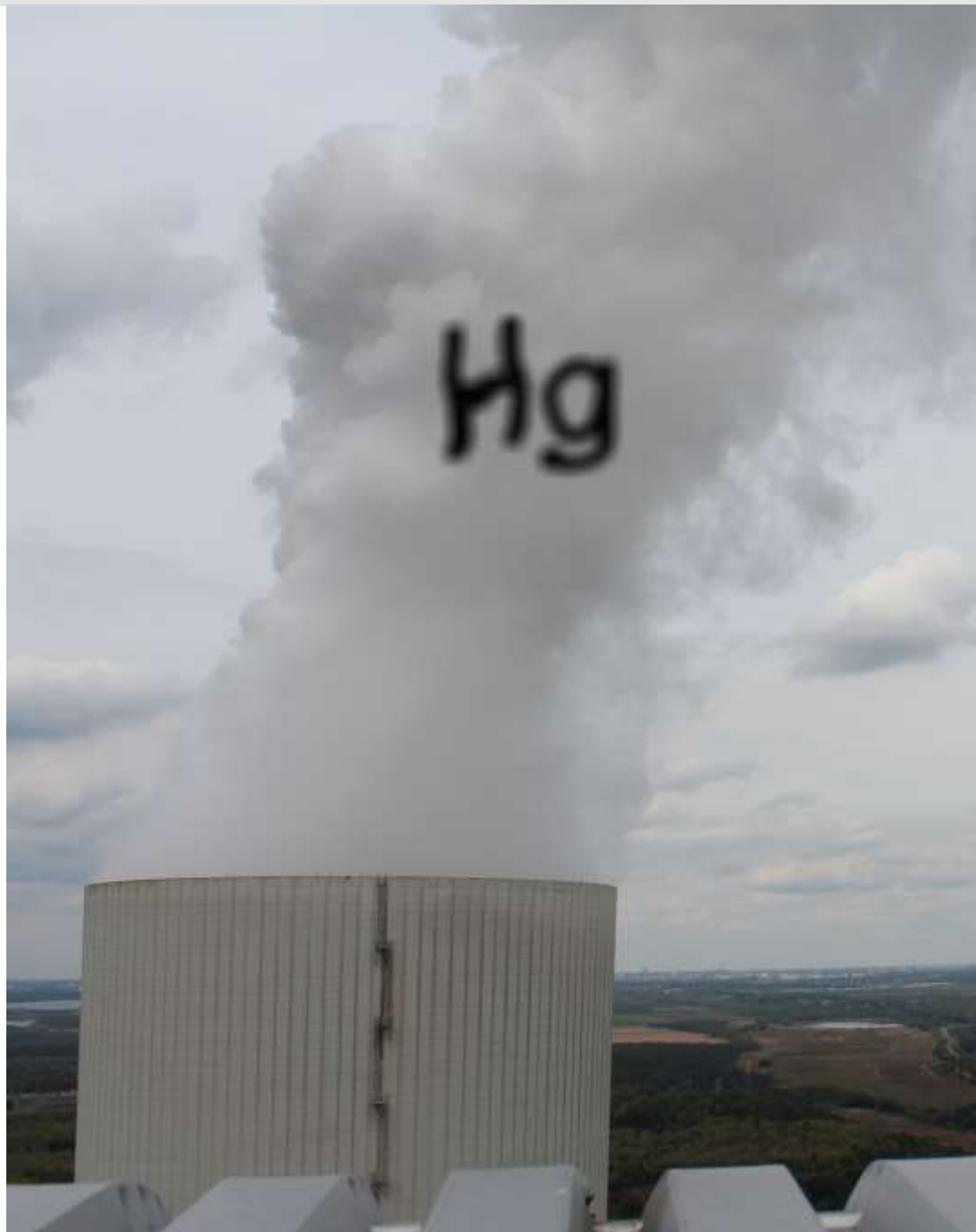
Kristina Juhrich

Mercury

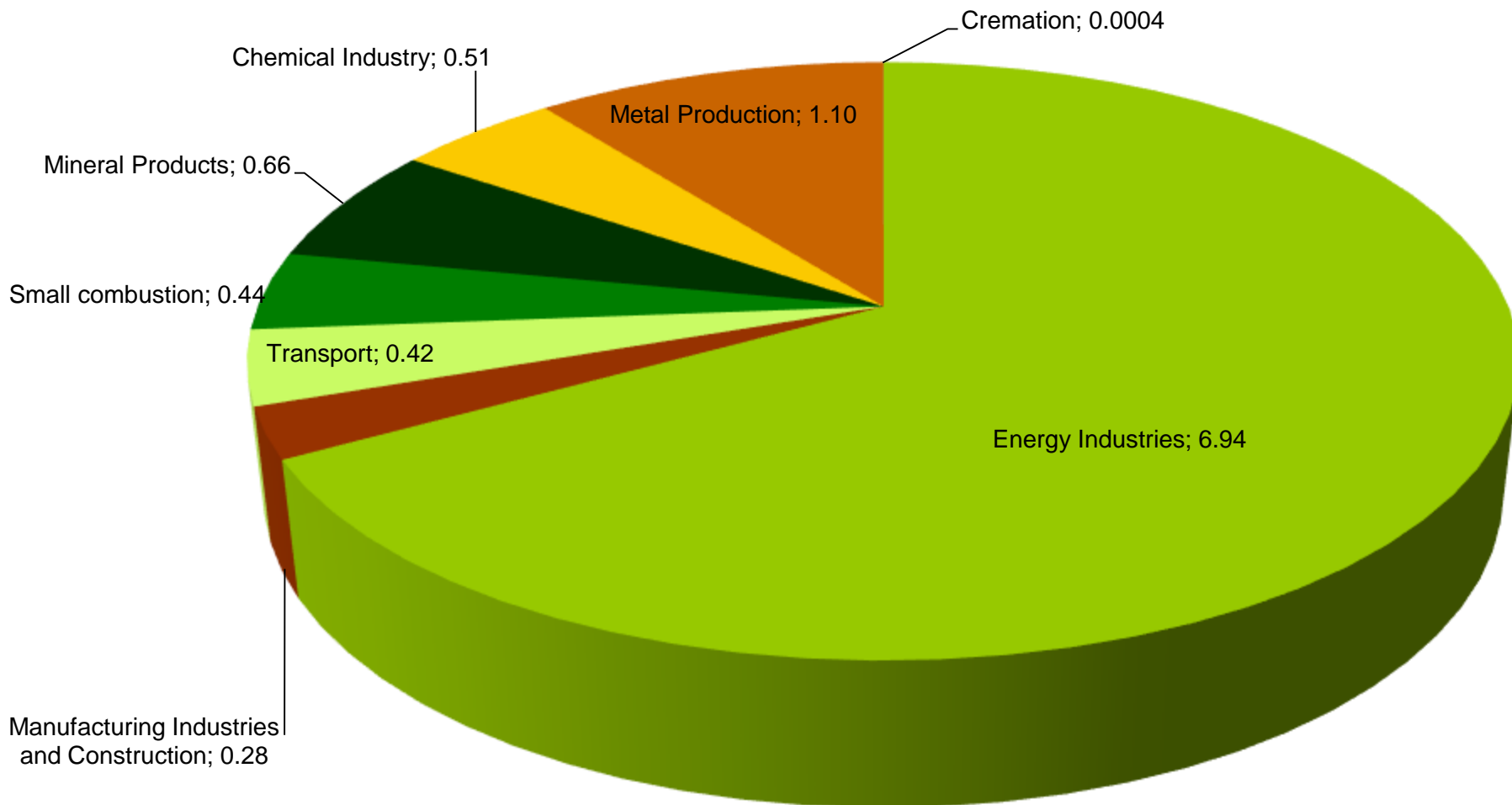
In German the meaning of the word mercury (*Quecksilber*) is “Living silver”.

Same meaning in Latin: *argentum vivum*

Mercury is a liquid metal, which changes more readily to the gaseous phase.



2012 Mercury emissions in t



Discovery of a remarkable underestimation in 2012

Underestimation in the range of **4.6 t** in source category 1.A.1



What happened?

A comparison with PRTR data showed that inventory data were remarkable lower

Analyses of PRTR data

- To find out if operators use a high default values
- If measurement data show other results

Combination of PRTR emission data with LCP fuel data (~ 80 plants)

- To calculate a comparable emission factor
- Distinction between measured (M), calculated (C) and estimated (E) values
- Additional quality control: comparison of NO_x and SO₂ emissions from PRTR with LCP data

Result:

Inventory emission factor was plausible but did not reflect the annual average of all German plants

Hg emission factors

Emission factors are average values for different years.

For Lignite a distinction is made for 4 mining regions of different coal qualities.

Fuel	range of PRTR values	Inventory (old value)	Inventory (new values)	Guidebook 2013 Default value
Lignite	0.8 – 9.5 g/TJ	0.5 g/TJ	3.5 g/TJ 2.1 g/TJ 2.4 g/TJ 4.3 g/TJ	2.9 g/TJ
Hard coal	0.3 – 4.4 g/TJ	1.0 g/TJ	2.1 g/TJ	1.4 g/TJ

Example: trend of Mercury emissions of one power plant



Behaviour of Mercury in the flue gas

Hg content of the fuel

Complete release into the flue gas as Hg^0

Hg^0 partial adsorption to particles

Partial oxidation to Hg^{2+} : depending on the presence of halogens and sulphur dioxides

Hg removal

Hg^0 : activated carbon filter

Particle: electrostatic precipitator or other dust filters

Hg^{2+} : desulphurization plant

SCR plant: promotes the oxidation of Hg and therefore Hg removal

Mercury re-emission

Some wet gas desulfurization plants convert oxidized mercury back to its elemental form, known as mercury re-emission.



Trend discussion – development of time series

Two different German countries in 1990

With different environmental standards

Eastern Germany (former GDR)

Only a few measurement data are available.
In some cases expert judgement is necessary.
Information on some important fugitive emissions (natural gas production with a very high Hg content) or emissions from product use is missing.

Western Germany

Same values were used for the whole time series (no considerable changes in abatement technology)
But a decreasing use of German hard coal with a high Hg-content

1990 data is very uncertain, possibly underestimated



New: reporting of Mercury from Chlor-alkali electrolyses (Mercury cell technique)

Presentation about the Mercury convention at UBA

Katja Kraus (chair of the task force on heavy metals) gave a presentation about the Mercury convention.

- Information that Mercury cell technique is still used in Germany
- Time series and emission factors were available at UBA
- Collaboration with many other experts is necessary



BASF 2010
View of a mercury cell room

Further Steps

Ongoing project on natural gas measurements (DBI Leipzig)

Measurements of different gas qualities (indigenous production and different import gases).

First results show, that the Mercury content of natural gas is extremely low.

Hg emission factor can be used for all sectors.

Ongoing project on coal analyzes

Analyzes of hard coal and lignite briquettes, which were used in small combustion plants.

Oil analyzes

Analyzes of light fuel oil and heavy fuel oil, which were used in small combustion plants.



Conclusion

Sometimes quality improvements can have a greater impact on the national totals than the closure of the last gap

Besides Mercury emissions are very uncertain...



Thank you very much
for your attention!

Kristina.Juhrich@uba.de