Opportunities to reduce mercury emissions through the Thematic Strategy on Air Pollution (TSAP) review and the revision of the National Emission Ceilings (NEC) Directive

7th March 2013

Mercury is a global pollutant which does not respect national nor regional boundaries and has severe adverse impacts on human health and the environment. The need to control emissions of mercury into the air has been highlighted in the 2005 Community Strategy on Mercury and more recently with the final agreement on the text of the Minamata Convention on Mercury, which is expected to be formally adopted in October 2013. The EU should now come up with new instruments to control emissions of mercury from major sources. With the ongoing review of the Thematic Strategy on Air Pollution (TSAP), the European Commission has an opportunity to address mercury emission into the air. In this paper, we explain why, in our view, it would make sense for the EU to include specific reduction commitments for mercury under the upcoming revision National Emission Ceilings (NEC) and to further address point relevant sources.

Mercury and its impacts on human health and the environment

Mercury and its compounds are highly toxic to humans, especially to the developing nervous system. They are also harmful to ecosystems and wildlife populations. Mercury affects humans in several ways. As vapour it is rapidly absorbed into the blood stream when inhaled[1]. Microbial metabolism of deposited mercury can create methylmercury, which has the capacity to collect in organisms (bioaccumulate) and to concentrate up food chains (biomagnify), especially in the aquatic food chain. Methylmercury is a well documented neurotoxin, which may in particular cause adverse effects on the developing brain. It readily passes through both the placental barrier and the blood-brain barrier. Therefore, exposures during pregnancy are of highest concern. It may also cause adverse effects on the cardiovascular system, thereby leading to increased mortality. Methylmercury compounds are considered possible carcinogens to humans according to the International Agency for Research on

[1] UNEP 2013, Mercury: Time to Act, p. 23

Cancer. Furthermore, inhalation of elemental mercury vapour includes symptoms such as tremors, insomnia, memory loss, neuromuscular changes, and headaches. Kidney and thyroid may be affected.

It is well known that mercury has no respect for national or regional boundaries, travelling long distances through the atmosphere, and has contaminated both the European and global food supplies at levels posing a significant risk to human health, according to the World Health Organisation (WHO), food safety authorities, medical and public health professionals around the world. Even the Arctic, which has no sources of mercury pollution, is experiencing dangerous levels of contamination in its marine mammals and other species which are part of the food supply.

A recently released study shows that within the EU, more than 1.8 million children are born every year with MeHg exposures above the limit of 0.58 microgram(µg)/g[2], and about 200,000 births exceed a higher limit of 2.5 µg/g proposed by the WHO. The total annual benefits of exposure prevention within the EU were estimated at more than 600,000 IQ points per year, corresponding to a total economic benefit between 8,000 million and 9,000 million Euro per year[3].

Sources of Mercury

Current anthropogenic sources of mercury emissions account for about 30% of the total amount of mercury entering the atmosphere each year. Another 10 % comes from natural geological sources, and the rest (60%) is from 're-emissions' of previously released mercury that has built up over decades and centuries in surface soils and oceans[4].

The main source of emissions of mercury in the EU is the burning of coal, but significant emissions also come from non ferrous metal industries, cement production as well as crematoria. For the year 2010, the EU was responsible for 87.5 tonnes of mercury emissions in the air, with around 50% being released from coal combustion plants[5].

Other sources of mercury emissions include pig iron and steel, chlor-alkali production, oil refining and product waste.

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[2] With regard to background exposures and the possible existence of a threshold, the U.S. EPA's Reference Dose (RfD) of 0.1 µg/kg body weight/day corresponds to a hair-Hg concentration of about 1 µg/g hair. Updated calculations resulted in an adjusted biological limit about 50 % below the recommended level, corresponding to 0.58 µg/g hair. The validity of this lower cut-off point below the RfD is supported by recent studies of developmental neurotoxicity at exposure levels close to the background. The study assumed that, below the 0.58 µg/g cut-off point, only negligible adverse effects would exist. http://www.ehjournal.net/content/12/1/3/abstract

[3] Environment Health 2013, Economic benefits of methylmercury exposure control in Europe: Monetary value of neurotoxicity prevention, http://www.ehjournal.net/content/12/1/3/abstract

[4] UNEP Global Mercury Assessment 2013, p.6

[5] UNEP Global Mercury Assessment 2013, p.11-12

Regulation of Mercury

Horizontal policies and objectives

In 2005, the EU adopted a Community Strategy on Mercury which has been reviewed in 2010. The Strategy's objective is to reduce mercury emissions, supply and demand, and reducing mercury levels in the environment and human exposure, especially from methylmercury in fish.

Under the EU Mercury Strategy, several actions have been taken to reduce supply and demand of mercury, such as the Regulation of Mercury Export Ban and Safe Storage, and the prohibition on placing on the market of measuring devices containing mercury. Such measures may have indirect impact on the emissions from the relevant sectors.

Globally, mercury emissions into the air are now addressed by the Minamata Convention on Mercury, the final text of which was adopted in January 2013. The treaty has similar objectives as the EU Mercury Strategy and requires mercury controls and reductions across a range of products, processes and industries. It requires parties to control and where feasible to reduce emissions of mercury and mercury compounds to the atmosphere through measures to control emissions from both new and existing sources falling within a specified list of source categories.

Regulation of mercury *concentrations* into the air

Mercury concentrations are partly addressed through the EU's Fourth Daughter Directive (4th DD) (Directive 2004/107/EC). This Directive completes the list of Directives addressing concentrations of harmful pollutants into the air, building on the (old) Framework Directive 96/62/EC. The 4th DD sets limit values for arsenic, cadmium, nickel, polycyclic aromatic hydrocarbons but not for mercury. Only monitoring requirements are specified for mercury [6].

In 2008, several air quality related directives merged into one: the Directive 2008/50/EC on Ambient Air and Cleaner Air for Europe. The 4th Daughter Directive was not included in this new directive, and no changes were made for the provisions related to mercury concentrations.

Setting a limit value for mercury was part of the discussion under the 4th DD. Some opponents to this idea argued that it would be more adequate to control overall emission levels rather than setting concentration limits for the ambient air. The upcoming revision of the NEC Directive provides an opportunity to actually control the EU's overall emissions of mercury into the atmosphere.

[6] EEB initial analysis recommending a review of the European Union's Mercury Strategy, 3/6/2010, p.9

Regulation of mercury *emissions* into the air

There is currently no legislation which directly limits emissions of mercury in the air in the EU, apart from those emitted by waste incineration and co-incineration.

The Directive 2000/76/EC on the incineration of waste (WI Directive)

The WI Directive sets emission limit values and monitoring requirements for emissions of mercury as well as other harmful pollutants. This Directive covers solid or liquid waste incineration plants as well as co-incineration plants but does not cover biomass incineration plants. The Directive sets mercury emission limit values for mercury relating to water discharges alongside limits for mercury emissions into air (annexes IV and V). The WI Directive will be replaced by the Industrial Emissions Directive as of 7 January 2014.

Large Combustion plants (LCPD) (Directive 2001/80/EC) and Industrial Emissions Directives (IED) (Directive 2010/75/EU)

Coal burning is the main source of emissions of mercury in the EU. However, there is no direct regulation of mercury emissions for large industrial sources (including coal fired power plants). Contrary to waste incineration, the LCPD and IED do not provide any legally binding emissions limits (ELVs) specifically for mercury. This contrasts with regulation in Germany and other parts of the world (US, China) where mercury emission standards for large combustion plants have been introduced.

The EU legislation does however provide a European safety net laying down minimum sector requirements, in particular binding ELVs for other pollutants such as sulphur dioxides (SOx), nitrogen oxides (NOx) and particulate matter (PM) for large combustion plants (Annex V, IED). Some co-benefits in reducing mercury emissions can be expected from these measures to control SOx, NOx and PM but the full potential of this is as yet far from being achieved, as is confirmed in the BIO IS 2010 report carried out for the EC-DG Environment on the Review of the Community Strategy on mercury[7]. To date, no specific study has been carried out to quantify the mercury reductions that can be expected from co-benefit abatement over time.

However, even with full implementation of the potential for the co-benefit removal of mercury this is, in many cases, not enough. Additional significant reductions in mercury emissions can be achieved by the use of mercury-specific pollution abatement techniques, such as activated carbon injection, which is now widely used in the United States. In its 2013 report, “Global Mercury Assessment 2013”, UNEP explains the decrease from 53 mt in 2005 to 29 mt in 2010 in U.S. mercury emissions from coal plants as largely attributable to “new regulations that have resulted in changes in the sources of the coal that is burned in large power plants and the installation of mercury controls as well as controls on sulphur dioxide and particulates that have the co-benefit of further reducing mercury emissions.”

Mercury emissions reductions may be achieved in the future under the implementation of the IED through the Best Available Techniques Reference documents (BREFs) and eventual Best Available

[7] Bio Intelligence Service 2010, Final Report – Review of the Community Strategy Concerning Mercury, p. 25

Technique Associated Emission Levels (BAT-AELs) within the BAT conclusions that are set for several industrial sectors. This is the case of Large Combustion Plants (LCPs) for which the BREF is currently under revision.

Further the IED mandates the European Commission to assess the need on whether to establish or update the European Safety Net (ELVs, monitoring and compliance) for other industry sectors on the basis of the environmental impact or state of BAT implementation of the activities concerned, for which special attention should be given to heavy metals[8]. Given that the above mentioned new BAT conclusions will not be published before 2014, meaning an effective compliance in 2018 at the earliest, an inclusion of mercury ELVs under the IED Safety Net would be a necessary complement to ensure quick investment decisions for cost effective pollution prevention/abatement techniques in most contributing sectors.

One needs also to consider however, that there is no direct relation between ELVs (rates of emissions) and mass emissions (total amounts emitted). Thus, whilst coal-fired power plants or other sources could be subject to controls of their rates of mercury emissions under ELVs, increased coal–fired production in the face of increased gas prices and concerns about the security of gas supplies (as is happening) could still lead to increasing mass emissions. Whilst BATAELs and ELVs may either be expressed in concentration limits or specific loads, ELVs take no direct account of the concentration of coal fired activity in any particular area – increased economic activity could comply with ELVs while still leading to pollution hotspots[9]. As discussed above, given the nature of mercury no matter the rate at which mercury is emitted, mercury will be released and continue to accumulate in the environment. Considering that the objective is to reduce mercury exposure in Europe, it is necessary that total emissions of mercury are reduced addressing all sources.

Addressing mercury via the revision of the NECD would speed up the implementation of the above mentioned policies and would provide an incentive to further reduce mercury from other most problematic sources.

[8] See Article 73 and recital 41 of the IED
[9] EEB and all, 2005: Zero Mercury- Key issues and policy recommendations for the EU Strategy on mercury, p. 40

Conclusions and recommendations

Given the effects caused by mercury it is imperative that mercury emissions in the air are reduced rapidly in the EU (and globally). Under the ongoing review of the Thematic Strategy on Air Pollution, the European Commission can contribute to this objective in several ways.

Mercury is directly addressed through the Industrial Emissions Directive, but only with respect to waste incineration. No specific measures have been taken so far to regulate total mercury emissions into the air.

The forthcoming proposal to revise the NEC Directive can provide a framework to reduce *overall* emissions of mercury into the air. It would complement action under the EU Mercury Strategy and would ensure that total mercury emissions actually decrease independent of future economic developments. It could deliver significant benefits for human health, ecosystems, wildlife populations and the environment.

These benefits can be achieved through the adoption of cost effective measures addressing the relevant sources, such as those under consideration under BREF documents.

Addressing mercury via the revision of the NECD would also provide further incentives to control mercury emissions from most problematic sources such as LCPs, the environmental performance levels of which are being currently revised.

Furthermore, the European Commission should consider new source specific control measures such as the update of the European Safety Net in the IED as a way of addressing pollution prevention at source for the main industry sectors concerned.

The adoption of such as the above measures by the EU could pave the way for mercury reductions outside Europe and would contribute to the implementation of the newly adopted global Mercury treaty.

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