Profiles

IEA CLEAN COAL CENTRE

Legislation, standards and methods for mercury emissions control

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Coal combustion is currently responsible for 46% of total global emissions of mercury to the atmosphere from human activities with over half of this contribution arising from coal combustion in power plants and industrial boilers. Mercury is the element of 'greatest global concern', according to the United Nations Environment Programme (UNEP) and, in response to increasing global concentrations of mercury, UNEP plans to finalise and ratify a new global legally binding instrument on mercury by 2013.

This report summarises current and impending standards globally and regionally which apply to mercury emissions from large-scale coal-fired power plants. At the moment there are a few international treaties and action plans which mention mercury but none requires action to be taken at the installation level. The only countries which currently have legislation which applied directly to mercury emissions and which require specific action to be taken are Canada and the USA. Canada currently has the Canada-wide Standards which set capped emissions and reduction targets on a provincial basis. Compliance requirements at the plants affected vary from the installation of mercury-specific control technologies (such as activated carbon, ACI) to plant closure or fuel switching to gas or biomass. The new Mercury Air Toxics Rule (MATS) in the USA sets challenging emission limits on a heat input basis which aim to reduce emission concentrations from all plants to the level achieved by the top 12% performing units in the country. This, in combination with the Cross-State Air Pollution Rule (CSAPR) for SO_2, NOx and other pollutants, means that the coal-fired capacity in the USA faces a challenging period of compliance. Table 12 shows the current (base capacity) installation of various control technologies on the US coal-fired station fleet and shows how this is likely to have changed by 2015. There is clearly going to be a high demand for dry scrubbers, FGD upgrades and sorbent injection systems over the coming years.

Other countries, such as those in the EU, do not currently have legislation set at a level which requires any action to be taken to specifically control mercury. However, significant mercury reduction is being achieved due to the co-benefit effects of pollution control technologies for SO_2 and NOx. Plants with FGD (flue gas desulphurisation) and de-NOx systems can achieve from under 50% to over 90% mercury reduction 'free of charge' with these technologies. As a result, countries such as those in the EU, Japan, Korea and, more recently China, are seeing significant mercury reduction despite no action being taken which targets mercury specifically. Despite this, there is still room for further emission reduction. China has recently introduced mercury emission limits and the EU may well consider some form of mercury control under the next review of the BAT (best available technology) reference documents.

Australia has little or no co-benefit mercury reduction and, as yet, has no plans for mercury emission limits. However, Australia's focus on greenhouse gas reduction may result in some mercury reductions in the future. India is perhaps the country of greatest concern with respect to emissions considering the rapid growth in coal consumption and the limited control technologies in place. Russian coals are typically low in mercury but the last of FGD and de-NOx on the majority of plants mean that co-benefit mercury reduction is currently minimal.

Mercury control options range from fuel switching, blending and cleaning, though the co-benefit effects of FGD and de-NOx systems to mercury-specific options such as ACI and oxidation. The least expensive options for mercury control are often fuel switching or fuel blending. Mercury reduction from low-grade coals such as lignites can be a challenge but adding some higher-grade coals, many of which contain higher concentrations of chlorine, can lead to reduced mercury emissions overall. Biomass cofiring can have a similar effect. Coal washing can, in some special instances, reduce mercury emissions by up to 70%. However, in most cases the average mercury removal is 30% or below. FGD systems are ideal for removing the soluble oxidised form of mercury. If there is an SCR (selective catalytic reduction) system for NOx control in place then this can enhance mercury oxidation and increase mercury capture in FGD systems. In some cases, the combination of fabric filter, SCR and FGD can achieve up to 95% mercury reduction as a co-benefit effect. However, this reduction is far from guaranteed. The variable behaviour of

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Installation of control technologies under MATS in 2015, GW		
Control technology	Base capacity	Total capacity with MATS
Wet FGD	180	174
Dry FGD	29	51
FGD upgrade	–	63
Dry sorbent injection	9	52
SCR	146	146
ACI	49	148
Baghouse/fabric filter	90	191
ESP	0	34

mercury in different coals and combustion systems mean that there is no single method which is suitable for all plants. In response to this, UNEP and the IEA Clean Coal Centre have produced the POG – the Process Optimisation Guidance document, to summarise the options available. An accompanying computer programme has also been produced which allows the user to model mercury behaviour in different coal-fired plant configurations. Together, these tools allow both experts and novices to compare potential mercury emissions from hypothetical coals and plants and to 'play' with different control options. The tool includes options for specifying coal and coal blend characteristics and in some cases coal blending alone can help achieve significant mercury reductions at some plants.

At the moment, the volatility of the market-place and the uncertainty in global economics means that it is not possible to consider the costs of various control systems in detail. However, it is clear that the mercury control market is growing rapidly in North America and that the technologies currently being developed and mobilised will result in improved and more cost-effective mercury control options being available globally in the future. If rapidly growing economies such as those in India and other regions of South East Asia are to be able to reduce mercury emissions from the coal combustion sector in the future, then the cost of mercury control is going to play a big part in determining what can actually be achieved.

This new report summarises national and international legislation on mercury and looks at how coal-fired plants in each country will have to adapt to comply. Other legislation, such as emission limits or reduction targets for SO_2 and NOx are also included as these are likely to influence mercury emissions through co-benefit effects. Information is provided on the different options for mercury control as well as guidance on the monitoring systems required to ensure compliance with any applicable emissions limits.

Each issue of *Profiles* is based on a detailed study undertaken by IEA Clean Coal Centre, the full report of which is available separately. This particular issue of *Profiles* is based on the report:

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Lesley Sloss
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* non-member countries
† member countries
‡ educational establishments within member countries

IEA CLEAN COAL CENTRE
Gemini House
10-18 Putney Hill
London SW15 6AA
United Kingdom

Tel: +44 (0)20 8780 2111
Fax: +44 (0)20 8780 1746
e-mail: mail@iea-coal.org
> **Internet:** www.iea-coal.org