*The only world worth passing to our children is toxics-free*

# MERCURY FACT SHEET: Mercury in Coal

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Since the onset of the industrial age global anthropogenic mercury emissions have increased 300 percent. While the sources of this pollution are numerous, by far the largest single source of mercury emissions is coal-fired power production. Nevertheless, mercury pollution from coal-burning power plants remains virtually unregulated in many parts of the world. In the Philippines, coal-burning power plants – the largest source of airborne mercury emissions in the country – emit nearly 100,000 metric tons of mercury to the environment every year, with nearly half emitted directly to the air.[1]

Still, the industrialized world is only just now coming to terms with the tremendous impact mercury emissions from coal-fired power plants have on public health and the environment. Consider that in the U.S. it was only in 1999 that the U.S. Environmental Protection Agency (EPA) started requiring utilities to monitor mercury emissions. While the results of these observations, and similar studies conducted around the world, demonstrate conclusively that mercury emissions from coal-burning plants must be reduced and eliminated, practical solutions are not going to come easily.

Elemental mercury is found mixed with fossil fuels like coal, oil, and gas. Most mercury emissions come when mercury-bearing materials are subjected to exceedingly high temperatures. When combusted, mercury in fossil fuels, wastes, and various ferrous and non-ferrous metals, is converted to elemental mercury and released as a gas. Concentrations of mercury in coal vary depending on the type of coal and its origin. If mercury in the coal is combined with mineral matter such as sulfides, it's possible to remove it with physical cleaning techniques.

But when mercury is combined with the organic fraction of coal, removal becomes increasingly difficult and expensive.[2] Mercury emissions from coal-burning power plants, therefore, vary depending on the quality of the coal, pollution controls, and coal scrubbing. An average 100-megawatt coal-burning power plant emits approximately 25 pounds of mercury each year,[3] while more pollution intensive plants emit as much as 500 pounds a year.[4]

The most obvious way to reduce coal's mercury emissions is to burn less coal. Yet despite the sensibility of this answer both in terms of reducing mercury pollution and reducing a host of other pollutants, most notably the greenhouse gas carbon dioxide, the fact remains that global coal consumption is expected to continue rising steeply over the coming three decades. Consequently, technical solutions addressing plant design, flue gas controls and coal scrubbing are certain to be central to resolving coal-mercury pollution.

Technological controls are capable of reducing mercury emissions as much as 90 percent.[5] However, it is estimated that tens-of-thousand of combustion units around the world use no flue gas cleaning devices at all.[6] No matter how effective these devices, installing these technologies is expensive making the leap to mercury reduction a controversial move.

## Rising Energy Use in Developing Countries

This combination of rising coal use and increased technological dependence spell difficulty for the less developed world, where coal use is projected to rise most, and there is little capacity to install expensive coal-reduction technologies.

Overall, energy use is expected to continue rising in the coming decades. In 2002, for instance, the World Energy Outlook, published by the International Energy Agency, projects an increase in global primary energy demand of 1.7 percent per year from 2000 to 2030, reaching an annual level of 15.3 billion tons of oil-equivalent.[7] According to this projection, by 2030 the world will be consuming two-thirds more energy than today; mercury emissions are likely to rise by as much as 5 percent of the global total. Meanwhile, carbon emissions will grow by 16 billion tons, or 70% above today's level.

Coal, not oil, is expected to be the fuel source countries will rely on to meet rising energy demands; and the developing world, not rich countries from the Organization for Economic Cooperation and Development (OECD), are expected to become the primary fossil fuel users. More than 60-percent of the increase in energy demand is expected to come from developing countries, which will ultimately surpass OECD countries as the world's largest group of energy consumers. China alone is expected to add 3.6 billion tons of carbon dioxide to the earth's atmosphere.[8]

At their current pace, China and India may account for two-thirds of the increase in world coal use. China generates more than 70 percent of its electricity from coal, and India generates 75 percent. In India, coal consumption is growing at a rate of nearly 5 percent per year.[9]

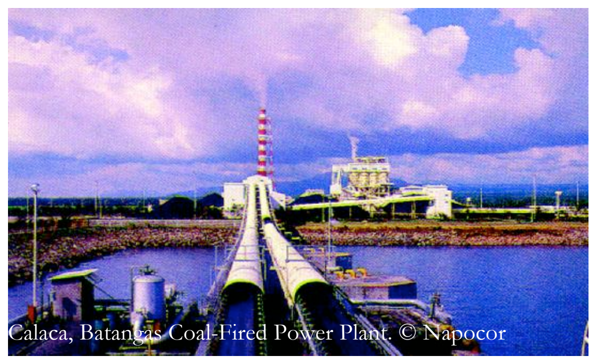
**Global *and* Local Effects**

The long-term impact of increasing coal use has tragic toxic consequence for the whole world, not only for less developed countries. Indeed, the bulk of atmospheric mercury emissions are emitted as an element in a gaseous state, and are capable of being transported long distances before dispersing in remote areas such as the arctic, where mercury contributes to what is known as the "Polar Sunrise."

According to the Center for Clean Air Policy, 50 percent of the mercury emitted from coal-fired power plants can travel up to 600 miles from the power plant. Similarly, the effects on the climate from increased carbon dioxide emissions have to be measured in terms of their overall global impact rather than according to a local index.

But not all mercury spewed out the tops of power plants are converted to a gaseous state and transported to the arctic. The remaining mercury emissions are released in their ionic states and are generally deposited within a few hundred kilometers of their source.[10] Moreover, mercury-bearing fuel wastes accumulate in the environment around power plants, giving mercury pollution from coal production a distinctly local flavor.

A study of power plants in the U.S. showed that half the mercury emitted from coal burning processes comes as waste collected by the incidental capture of mercury in devices designed for sulfur and other pollutants, as well as from scrubbing coal prior before it's burned.[11] Without sufficient safeguards, it's easy for this waste-mercury to be dumped in populated areas or into nearby waters, where it contaminates soils, water supplies and fish.


Calaca, Batangas Coal-Fired Power Plant. © Napocor

In less developed countries it is common to have few regulatory controls to ensure safe disposal of mercury waste. In the Philippines, where coal is the country's largest source of natural fossil energy, one 600-MW coal plant in Calaca, Batangas produces 62.62 tons of ash every hour, exposing the surrounding population to dangerously high mercury levels 24 hours a day.[12]

According to Greenpeace, none of the five existing coal-fired power plants in the Philippines, nor the neighboring communities, are being monitored for mercury contamination. Indeed, most places don't even have medical evaluations testing mercury exposure of people living in proximity to power plants

Local problems connected with coal-mercury emissions in developing countries are not restricted to industrial uses of coal. In many places, coal is used for domestic functions such as heating and cooking, and is burned in simple household stoves, exposing people directly to emissions of toxic metals and organic compounds. In China, several hundred millions of people commonly burn raw coal in unvented stoves, and use coal briquettes to dry corn and other foods.[13]

This type of coal-use poses an extremely high risk because the coal typically has higher mercury concentrations than coal that is burned in an average power plant. For instance, in Guizhou Province in southwest China – where domestic coal consumption is commonplace – mercury levels in coal were measured as high as 55 parts-per-million, approximately 200 times the average mercury concentration for U.S. coals.

Little is known about the mercury content of different coals used in the developing world.

**Conclusions**

By ramping up fossil fuel-based energy production, the world's less developed countries – led by China and India – are well on their way to following the West's blueprint for "dirty" industrial development. This time, however, the cost to public health and the environment will be even more drastic: China and India together account for more than one-third of the world's population, meaning more people than at any other moment in history will be exposed to the devastating health hazards of mercury pollution.

Filling in data gaps about the kinds of coal used around the world can do little to offset the overall risks posed by the developing world's energy development trajectory. If, as projected, coal use continues rising and pollution control technologies are not transferred to developing countries, the effects will be deadly no matter what kind of coal is used. To reduce mercury pollution from coal-burning power plants in developing countries, mercury control technologies must be transferred at affordable rates.

But pollution control technologies merely exchange mercury burden from one pathway – air – to another pathway – waste. As the authors of the UNEP Global Mercury Assessment point out: "[M]ercury emissions control, while mitigating the problem of atmospheric mercury pollution, serves only to transfer mercury one medium to another and should be accompanied by a comprehensive and safe disposal strategy."[14]

End-of-pipe mercury reduction has to include retirement strategies for captured mercury in order to minimize the amount of mercury released to environment. But pollution controls and retirement strategies are expensive, making it crucial for developing countries to get financial support from the West. Moreover, global mercury policy cannot be treated in isolation from other pollution problems created by coal burning – most importantly climate change. Mercury, unlike, carbon dioxide, has no safe pollution threshold. One teaspoon of mercury is enough to contaminate a 25 square mile lake. The only guaranteed way to eliminate mercury emissions from coal is the simplest answer possible: burn less coal.

References:


[1] Philippine Department of Environment and Natural Resources Mercury Inventory, 2008.
[2] UNEP Global Mercury Assessment, chapter 8.3.1
[3] "Clean the Rain, Clean the Lakes: Mercury Rain is Polluting the Great Lakes," NWF and Great Lakes Natural Resources Center Report, p. 6, September 1999
[4] "Mercury Falling." Environmental Working Group, Clean Air Network, NRDC, 1999, p.1. Available at www.ewg.org.
[5] UNEP Global Mercury Assessment, Chapter 8.3.
[6] UNEP Global Mercury Assessment, Chapter 8.3.
[7] *World Energy Outlook 2002*, International Energy Agency, Executive Summary p. 26, http://www.worldenergyoutlook.org/
[8] *Id.*
[9] Czech Republic generates 70 percent from coal, and Poland 95 percent; the U.S. gets half its electricity from coal.
[10] UNEP Global Mercury Assessment, chapter 6.4.4
[11] "Mercury Falling." Environmental Working Group, Clean Air Network, NRDC, 1999. www.ewg.org. Note: 98,000 pounds (49 tons) of mercury are emitted to the atmosphere by coal-burning power plants each year in the U.S. 81,000 pounds (40 tons) ends up in power plant waste from air pollution controls installed for other pollutants; 20,000 pounds (10 tons) occurs in cleaning of coal prior to burning.
[12] "Coal-Fired Power Plants and the Menace of Mercury Emissions," A Greenpeace Southeast Asia Report, August 2001.
[13] "China and U.S. Geological Survey…Working Together on Environmental Issues." USGS News Release, June 23, 1998.
[14] UNEP Global Mercury Assessment, Chapter 8.1



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