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Power Plant Poisons under the Radar

Power plants burning fossil fuels (“fossil plants”) are major contributors to poor air quality, to the degradation of our nation’s waters through deposition of airborne mercury and dioxin, and to the acid rain damage of our eastern and northern lakes and forests. Fossil fuel power plants burn coal, oil, and natural gas and, depending on market conditions, a facility may switch fuels. Some fossil plant pollution is well known to the public, but some remains under the public’s radar. Here are some of the well-known and the under-the-radar fossil plant pollutants:

- **Global Warming Gases:** 40 % of man-made carbon dioxide emissions, a pollutant threatening our global climate, are from fossil-fuel power plants.
- **Smog and Haze:** 23% of nitrogen oxide emissions which contribute to smog (ground-level ozone) and haze formation are from fossil plants.
- **Acid aerosols:** Acid aerosols include the fumes, gases, mists, tiny particles, and droplets formed in the atmosphere by sulfur dioxide, hydrogen chloride, hydrogen fluoride and other acid gas emissions. These aerosols cause lung damage and contribute to the development of chronic respiratory disease (e.g., asthma, bronchitis) especially in children and the elderly. They contribute to the formation of acid rain which has damaged so many eastern and northern forests and lakes. Acid deposition plays a role in the chemical transformation of mercury in waters and has been connected to elevated mercury concentrations in fish and fish-eating wildlife such as the common loon, mink, otter, and eagles. 67 % of the nation’s sulfur dioxide emissions are from fossil plants.
- **Particulate matter:** A large share of fine particulate matter or soot is produced by fossil plants. Sulfur dioxide, nitrogen oxide, and related compounds react in the atmosphere to form fine particulate matter, a form of pollution contributing to the deaths of thousands of Americans each year.
- **Radionuclides:**¹ Fossil fuels contain radioactive elements including uranium and thorium which are released in the ash and emitted into the air from fossil plant stacks.
- **Hazardous Air Pollutants:** Awareness of the terrible impact of mercury pollution from fossil-fuel fired power plants on our lakes and streams has been raised by the issuance of public health advisories across 48 states and many of our coast waters warning us about the danger of consuming mercury-contaminated fish. Few people are aware that several states have issued warnings for fish caught in our North Atlantic coastal waters due to dioxin contamination. Many other hazardous air pollutants generated by fossil plants remain under the radar, endangering life and health without public notice and without regulatory controls (Table 1). Coal and oil combustion generate the lion’s share of hazardous air pollutants (Table 2).

¹ Radionuclides are also listed as Hazardous Air Pollutants and radioactive metals including uranium and thorium are emitted by coal-fired power plants. The EPA estimates that coal-fired utilities are contributing about 25 percent of the cancer incidence and oil-fired utilities the other 75 percent.

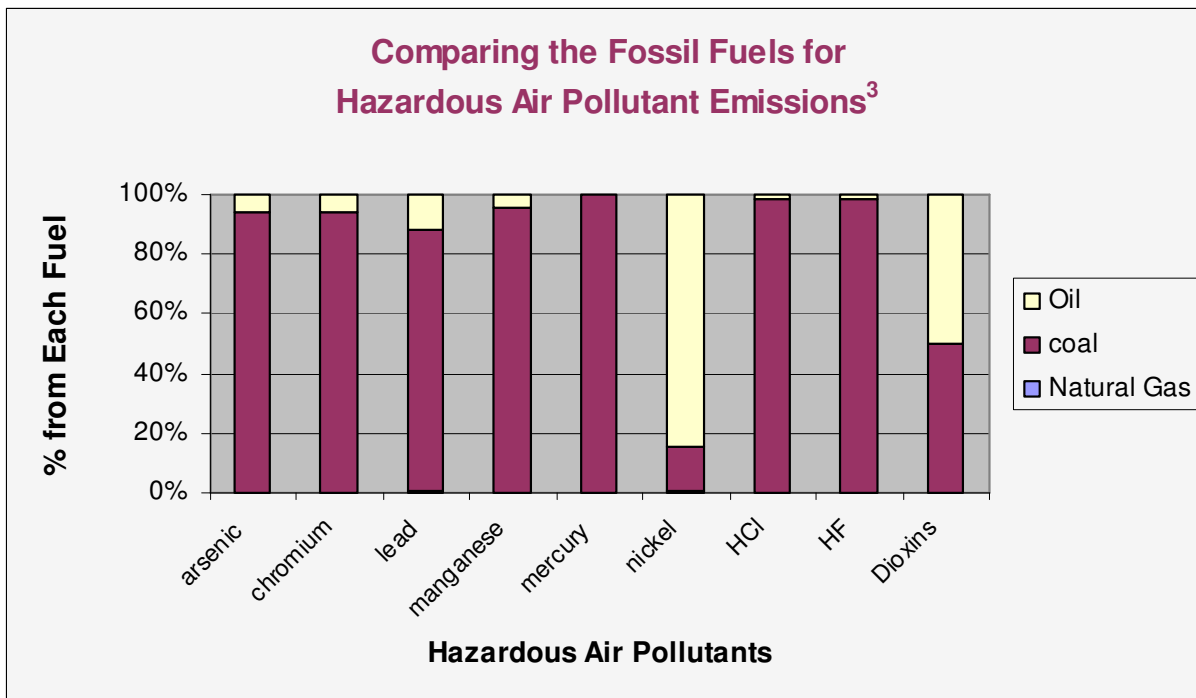
Hazardous Air Pollutants and Coal-Fired Power Plants

Table 1. 2005 Emissions for US EPA-designated “Hazardous Air Pollutants” Dominated by Fossil-fuel Fired Power Plants²

Hazardous Air Pollutants	Fossil Fuel Power Plant Air Emissions (Tons)	Fossil Fuel Power Plant Portion of All Industrial Air Emissions	Human Carcinogen ²	Persistent Bioaccumulative Toxin
METALS				
Chromium compounds	78.5	31%	Known for Cr (VI) form	PBT
Cobalt compounds	16.5	52 %		
Lead compounds	87.5	22 %	Probable	PBT
Manganese	156.5	19 %		
Mercury	46.5	74 %		PBT
Nickel compounds	259.5	59 %	Known	PBT
NONMETALS				
Selenium compounds	253.5	92 %	Known	PBT
Arsenic compounds	46	75 %		PBT
Hydrochloric acid (HCl)	257	91 %		
Hydrogen fluoride (HF)	31	83 %		
Dioxin & dioxin-like compounds	605.6 grams	48%	Known	PBT

² US EPA has designated 188 "hazardous air pollutants." Pollutants for which fossil fuel fired power plants burning oil, coal, and natural gas contribute a large share of the total emissions are listed. The US EPA 2005 Toxic Release Inventory lumps together the emissions from electric power generation, transmission, and distribution from all major nuclear, hydroelectric, renewable energy, oil, natural gas, and coal-fired power plants. However, HAP emissions from all but fossil fuel plants are negligible so HAP emissions reported for this industrial sector may be attributed to fossil fuel fired power plants alone. Data for 1994 HAP emissions is found in the Executive Summary for EPA's utility report to Congress (US EPA 1996).

Table 2 Major HAP emissions generated in 2005 by Power Plant Fossil Fuel Combustion of 8,969 thousand tons of coal, 8,392 thousand barrels of petroleum, and 713,000 thousand Mcf of natural gas³



Hazardous Air Pollutants and the Clean Air Act

EPA has specifically designated certain chemical pollutants as “air toxics” or “hazardous air pollutants.” These 188 pollutants cause cancer or other serious human health effects, such as reproductive problems or birth defects, and can cause serious adverse environmental and ecological damage.

The 1990 Clean Air Act amendments directed EPA to set emissions standards for industries which are major contributors to toxic air pollution. EPA has already set air toxics standards for chemical manufacturers, industrial boilers, incinerators, dry cleaners, and scores of other industries. In addition to evaluating these industries, EPA was also required by the Act to study the toxic emissions from power plants to determine whether it would be “appropriate and necessary” to regulate them as well. By 2000, EPA had completed its study and formally determined that power plants did indeed churn out major amounts of air toxics, hundreds of thousands of tons of air toxics, and that air toxics standards were necessary.

The EPA Switch-a-roo

In legal settlement agreements brought on by Agency foot-dragging, the EPA agreed to issue standards by the end of 2004. But instead, in 2005, the EPA pulled a switch-a-roo. EPA claimed that power plants were not a big problem after all and they walked away from their legal commitment and their statutory duty to set new limits on toxic power plant emissions! The Agency released a watered-down so-called “Clean Air Mercury Rule” that set some delayed, weak standards for mercury emissions and ignored all of the other toxic metals, acids, and other chemicals emitted by power plants.

³ Updating these emissions figures for 2005 was done by utilizing data showing increase in usage for each fuel since 1994 as reported by the Energy Information Administration (US EIA 2005).

The Sierra Club Fights Back

In 2006, the Sierra Club, the National Wildlife Federation, and Environmental Defense, represented by Earthjustice, challenged the Administration by filing a federal lawsuit to protest the EPA's unlawful actions. By walking away from their obligation to set limits on air toxics, the EPA has abandoned millions of Americans adversely affected by power plant poisons. The Sierra Club is asking the courts to turn EPA around and put them back to work. We must continue to put pressure on the government and big industry to properly regulate hazardous air emissions so that America's families and wildlife get the protection they need and deserve.

Chemical Profiles: A Closer Look at the Hazards behind Power Plant HAPs

Metals

Chromium: Chromium is a naturally occurring element that exists in several forms. One form commonly produced by industrial processes is chromium VI. Exposure to Chromium VI may result in nosebleeds, holes and ulcers in the nasal septum, and lung cancer. In the environment, chromium VI is associated with behavioral changes, abnormal enzyme production, and impaired immune response in fish and mammals and the inability to perform basic functions in plants. The presence of chromium VI can change the composition of an ecosystem, altering species diversity.

Cobalt: Human health impacts following exposure to high levels of cobalt include lung and heart defects and well as liver and kidney dysfunction.

Lead: Human exposure to lead can affect every organ in your body; however, lead toxicity targets the nervous system. Health effects include decreased function of the nervous system, increases in blood pressure, reproductive dysfunction, and brain and kidney damage in adults and especially in children. Lead is a cumulative poison in the environment and is especially toxic to fish. Lead leads to excess mucus production in fish gills resulting in impaired respiration and eventual death.

Manganese: Exposure to high levels of manganese can result in impaired motor function and decreased muscle control, as well as respiratory problems and sexual dysfunction.

Mercury: In humans mercury can severely impair the brain, kidneys, and developing fetuses. Brain functioning defects can result in irritability, tremors, memory problems, and decreases in vision or hearing. Mercury is highly toxic to most organisms and can build up in the tissues of fish, birds, and mammals.

Nickel Compounds: Nickel compounds are carcinogenic to humans as well as to animals. In humans, chronic exposure to nickel compounds may also lead to bronchitis and reduced lung function. In animals, nickel impedes reproduction and development resulting in physical deformities and high mortality.

Non Metals

Arsenic: Exposure to low levels of arsenic can result in sore throats and irritated lungs, darkened skin, and the development of warts. Inorganic arsenic is also a carcinogen that has been observed to decreased brain function in children. In the environment, arsenic accumulates in fish and shellfish as well as in soil or sediment. Arsenic is especially toxic to fish and can result in abnormal physical characteristics and death.

Hydrochloric Acid: In humans, hydrochloric acid harms any tissue it contacts. Health effects may include throat irritation, teeth discoloration, respiratory problems such as rapid breathing, suffocation and reactive airways dysfunction syndrome, and even death.

Hydrogen fluoride: The chronic inhalation to low levels can result in irritation and congestion of the nose, throat, and bronchi. Among chronically-exposed workers, increased bone density has been reported. In animal studies, chronic inhalation has produced liver, kidney, lung and reproductive organ damage.

Selenium: Short-term exposure may cause nausea, vomiting, and diarrhea whereas chronic exposure may result in a disease called selenosis. Selenosis is characterized by hair loss and neurological abnormalities. In the environment, selenium travels long distances and produces mortality and reproductive failure in fish.

Dioxin and dioxin-like compounds: High exposure causes severe skin disease in humans (chloracne). In animals, these chemicals cause developmental disorders, skeletal deformities, kidney defects, and weak immune responses in the offspring of animals in utero. Dioxin accumulates in the food chain.

References

Irwin, R.J., M. VanMouwerik, L. Stevens, M.D. Seese, and W. Basham. 1997. *Environmental Contaminants Encyclopedia*. National Park Service, Water Resources Division, Fort Collins, Colorado.

Schmitt, C.J. 1999. Environmental contaminants. Pp. 131-166 in M.J. Mac, P.A. Opler, C.E. Puckett Haecker, and P.D. Doran, eds. *Status and Trends of the Nation's Biological Resources. Volume 1*. U.S. Department of the Interior, U.S. Geological Biological Resources Division, Environmental and Contaminants Research Center Survey, Reston, VA

US Department of Health and Human Services, Agency for Toxic Substances and Disease Registry. *ToxFAQs*. <http://www.atsdr.cdc.gov/toxfaq.html#bookmark05>

Energy Information Administration. 2006. Electric Power Annual with data for 2005. Table 4.1. Consumption of Fossil Fuels for Electricity Generation by Type of Power Producer. <http://www.eia.doe.gov/cneaf/electricity/epa/epat4p1.html>

US EPA. Health Effects Notebook for Hazardous Air Pollutants. <http://www.epa.gov/ttnatw01/hlthef/hapindex.html>

US EPA. 1996. Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units -- Final Report to Congress. <http://www.epa.gov/ttn/caaa/t3/reports/eurtc1.pdf>

US EPA. 2005 Toxic Inventory data Release. <http://www.epa.gov/tri/>

Wisconsin Department of Natural Resources. Acid Rain in Wisconsin. WDNR *publication AM-129-94*. <http://www.dnr.state.wi.us/org/aw/air/health/acidrain.htm>