BEYOND COAL

Coal Threats to Human Health – Fact Sheet Series

*Although abundant here, Alaskans do not rely on coal as a primary fuel source. Here in Alaska, we are increasingly looking for cleaner sources of energy to supplement or replace fossil fuels. While there is increasing pressure to develop coal for foreign export and domestic use,[1] **coal is dirty**. Coal exploration and development threaten human health and our land, air, water and food, with hazardous emissions possible at every stage.[2] Pollutants from coal adversely affect all major organ systems in the human body and contribute to four of the top five causes of death in the United States: heart disease, cancer, stroke, and chronic lower respiratory diseases.[2] To prevent these human health risks, a growing number of health care providers, tribes, parents, fishing groups, ratepayers, and other concerned Alaskans are working together to **keep Alaska's coal in the ground**.*

COAL ASH AND YOUR HEALTH

WHAT IS COAL ASH?

Coal ash, or coal combustion waste, is the particulate material that remains after coal is burned.[3] There are several different kinds of coal ash:

- **Fly ash** travels up the chimney of coal-fired power plants and usually has a powder-like consistency. Fly ash may be released directly from the chimneys or collected from flue gas.
- **Bottom ash** is removed from the bottom of the boiler at the power plant. Bottom ash is coarser and more granular than fly ash and may have the consistency of sand or gravel.
- **Boiler slag** is formed when molten ash is cooled with water and crystallizes into a black granular material.

Coal ash is a complex mixture that varies with the type of coal, the pulverization and combustion processes used, and precipitation techniques.[3] The variable nature of coal ash makes it difficult to regulate effectively because some coal ash may contain significantly more contaminants than average. In addition, coal ash at power plants that have installed air quality control devices may actually contain even higher levels of toxic chemicals, as these chemicals have been redirected into the solid waste.

Chemical constituents of coal ash may include nitrogen, sulfur, unburned carbon, heavy metals, radioactive elements, and polycyclic aromatic hydrocarbons (PAHs).[3,4] Coal ash also contains coarse particles and fine particles which can be inhaled and may contribute to public health and environmental problems.

About 70 million tons of coal ash are produced annually by coal-fired power plants in the United States.[5] This waste is often stored in holding ponds or landfill sites after it is collected from the power plant.[6] These coal ash storage areas are often kept wet so that the ash is not released into the air; however, wet storage of coal ash puts drinking wells and surface water at risk of contamination from leaching. The safest disposal method for coal ash is considered to be storing dry ash in capped, lined landfills with collection systems for contaminated water.

The majority of coal ash is disposed of in landfills or placed back into mines, but about 40 percent of coal

Dump truck disposing of steaming coal ash in Fairbanks, June 2010

Above, left: www.solarpowerwindenergy.org Center: Sierra Club Right: www.coal-is-dirty.com

ash is reused, primarily as an additive in construction materials like cement, drywall and asphalt, or as structural fill.[7] Alaska currently has six coal-fired power plants, all located between Healy and Fairbanks in Alaska's Interior.[8] Coal ash from these facilities is used as fill in local areas, including public spaces, wetlands, university grounds, and residential neighborhoods.

How Are We Exposed to Coal Ash?

People can be exposed to coal ash from disposal sites and environmental contamination. Living near coal-fired power plants, coal ash ponds, landfill sites, or coal ash amended soil puts people at risk of exposure to coal ash.[6,9] Exposure may occur through inhaling air or drinking water polluted by coal ash.[6] Coal ash ponds and landfill sites may leach into drinking water sources.

People may also be exposed through consumption of food contaminated by coal ash, such as eating fish that have been exposed to contaminants in coal ash or eating foods grown in soil that has been amended with coal ash. Indiana University researchers measured heavy metal uptake by vegetables growing in soil amended with coal ash and found that arsenic reached potentially toxic levels in basil and zucchini.[10]

Exposure may also occur due to uses of coal ash in public areas, workplaces, and homes. Coal ash is commonly used as filler material in a wide range of materials, including soil, bricks and cement, driveways, building sites, and recreational areas like sports fields and golf courses.[9,11] Attempts to reuse or "recycle" coal ash have been linked to environmental pollution. For instance, groundwater wells near a golf course in Virginia that was built using 1.5 million tons of coal ash were found to be polluted with lead and arsenic at levels that exceeded drinking water standards.[5]

Garden in front of the coal ash loading facility at the University of Alaska Fairbanks coal-fired power plant, June 2010

What Does Exposure to Coal Ash Mean for Our Health?

The presence of environmental chemicals in the human body does not necessarily cause adverse health effects; however, environmental chemical exposures can and do affect human health. It is important to note that both the dosage and the timing of exposure have significant effects on any potential health outcome. The following information from both human and animal studies summarizes the current state of knowledge on the health effects of coal ash. Alaskans face the following potential health risks from increased coal ash exposure if proposed coal-fired power plants are developed in the state and if improper disposal of coal ash waste continues.

Cancer

A review by the U.S. Environmental Protection Agency (EPA) found that cancer risk due to arsenic exposure from contaminated drinking water was as high as one in 50 for people living near unlined coal ash ponds, which is 2,000 times higher than the EPA's goal of reducing cancer risk to one in 100,000 people.[12]

Genetic Damage

In a recent study, human cells exposed to coal ash showed genetic mutations and damage.[6] Workers in a coal-fired power plant who were routinely exposed to coal ash and other combustion byproducts were more likely to have chromosomal markers indicating genetic damage.[3]

Respiratory & Cardiovascular Health Effects

In an occupational study, workers with prolonged exposure to coal ash were more likely to have decreased lung function compared to workers with less exposure.[13] People with chronic obstructive pulmonary disease (COPD) and asthma may also be more susceptible to airway irritation from coal ash.[14] Animal studies have also confirmed that inhaling particulate

matter from coal ash is linked to airway reactivity and inflammation.[15]

Radium-226 and Radium-228 are the main sources of ionizing radiation in coal ash and may remain in the lungs for several months after exposure. These isotopes will gradually enter the circulatory system and deposit into the bones and teeth.[4] Health effects of radium-226 and radium-228 have been studied in cleanup workers on the Chernobyl nuclear power plant accident who inhaled large quantities of these two elements, and it was found that they later suffered from airway lesions and increased susceptibility to lower airway infection.[16]

HEALTH EFFECTS LINKED TO COAL ASH

- Cancer
- Genetic damage
- Respiratory health effects:
  - Decreased lung function
  - Exacerbation of asthma & COPD
- Cardiovascular health effects (from particulate matter):
  - Irregular heartbeat
  - Heart attacks

Coal ash is made up of different particle sizes which may be inhaled and become lodged in the lungs or enter the circulatory system. According to the EPA, coarse particles of concern are between 2.5 and 10 micrometers in diameter and fine particles are less than 2.5 micrometers in diameter.[17] Ultrafine particles which are less than 0.5 micrometers in diameter have also been identified in coal ash.[18] Inhaling particulate matter has been linked to decreased lung function, aggravated asthma, development of chronic bronchitis, irregular heartbeat, heart attacks, and premature death in people with heart or lung disease.[17] Children, older adults, and people with heart or lung diseases are the most vulnerable to the health effects of exposure to particle pollution.

REGULATION OF COAL ASH

Based on the definition in the Resource Conservation and Recovery Act, coal ash is not considered a hazardous waste. Instead, it is considered a solid waste and primarily regulated by individual states.

Unfortunately, current regulations are not protective of the environment and human health. In its 1999 review of coal combustion waste regulations, the EPA found that just over half of coal ash waste landfills are lined to prevent leaching and less than half have systems in place to collect the toxic substances that leach out.[19] In a review of 89 coal combustion waste impoundments, the EPA determined that 80% were either a proven environmental hazard or a potential environmental hazard, based on ground and surface water contamination.[20]

In May 2010, the EPA acknowledged the need for federal regulation of coal ash and began the process of reviewing possible regulatory mechanisms. On June 21, 2010, the EPA published a proposed coal ash rule, triggering a 90-day public comment period. The EPA's proposal includes two options for regulation, one under Subtitle C of the Resource Conservation and Recovery Act (RCRA) and the other under Subtitle D. The Subtitle C option is vastly more protective of human health and the environment, as it would effectively regulate coal ash as hazardous waste with safeguards for storage,

REDUCING YOUR EXPOSURE

You can reduce your exposure to coal ash in the following ways:

- Avoid using coal ash as filler material at home:
  - Use organic fertilizers and compost tea to enrich your soil.
  - Use gravel as fill for driveways instead of coal ash.
  - Beware of "green" cement or bricks. Some companies sell cement and bricks produced using coal ash and market them as an earth-friendly alternative. Instead, use bricks made from clay which do not contain high concentrations of radon, lead and arsenic.
- Buy organic produce or produce that has not been grown in coal-ash enriched soil. Ask local farmers how they fertilize their crops and buy from farmers who use safe fertilizers.
- Use a water filter that removes toxic chemicals including heavy metals and radioactive elements, especially if your water source is near a coal-fired power plant, a coal ash dump site, a farm where coal ash is used, or a place where coal ash has been used as fill.

handling, transport and disposal. In contrast, the Subtitle D option would not establish any federally enforceable standards, likely resulting in the same patchwork of inadequate state regulations that have proven ineffective in the past.[21]

"The writing is on the wall, the floor, the ceiling, everywhere… Arsenic, selenium and other pollutants from coal ash pose a toxic threat to drinking water, fish and wildlife populations, and our health."

- Lisa Evans, Earthjustice

What Can I Do?

Get involved in other actions to prevent coal development in Alaska and to protect your community from coal ash and other hazardous chemicals associated with coal development. Here are some ways you can help:

Submit comments to the EPA in support of the Subtitle C option of the proposed coal ash rule. The EPA is currently considering proposals for coal ash regulations, and public input is encouraged. This is a great opportunity to have your voice heard on this important issue. When submitting your comments, make sure that they are identified by the special docket number associated with this rulemaking. The docket number for this coal ash rule is: EPA-HQ-RCRA-2009-0640. You can submit comments **before November 19, 2010** to EPA online or by email, fax or mail:

- Online: Click here to submit your comments. Or, go to www.regulations.gov and search for keyword EPA-HQ-RCRA-2009-0640 (check the box for document type "Proposed Rules"). In the window where it says "results for keyword EPA-HQ-RCRA-2009-0640," click on "Submit a comment."
- Email: Include your comments as an attachment or in the email's text, then email to rcra-docket@epa.gov. Include the docket number in the subject line. Note that Internet submissions are anonymous but email submissions are not.
- Fax: Send to 202-566-0272 and make sure to write the docket number on your cover sheet.
- Mail: Include two copies of your comments and send to:

  Hazardous Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities Docket
  Attention Docket ID No EPA-HQ-RCRA-2009-0640
  Environmental Protection Agency
  5305T
  1200 Pennsylvania Ave., NW
  Washington, DC 20460

Look for action alerts at www.akaction.org and www.alaskacoal.org.

Sign up for email alerts and information about health impacts of coal by contacting sarah@akaction.org.

For more information, contact Alaska Community Action on Toxics at 907-222-7714 or visit www.akaction.org.

ACAT Alaska Community Action on Toxics

This fact sheet is part of the *Coal Threats to Human Health* series, produced by Alaska Community Action on Toxics for the Beyond Coal Human Health Campaign. For more information, contact us at 907-222-7714 or visit www.akaction.org.

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