



By Craig M. Pease

Coal Burning: A Fly in the Ash

Coal ash is an immense environmental problem. It consists of the fly ash, bottom ash, and other combustion byproducts that remain after coal is burned, of which fly ash is easily the most abundant waste. Burning coal in power plants to generate electricity generates over 100 million tons of coal ash each year in the United States alone, enough to fill about 1 million railcars, if only we had someplace safe to move it.

Like Dr. Seuss's oobleck, which too came from the air, once on earth we can move toxic metals like the mercury in fly ash from spot to spot, but absent an act of magic, they never just go away. Capturing fly ash as it leaves a stack does however move it from the realm of air pollution regulated by the Clean Air Act into the realm of hazardous and solid waste regulated by the Resource Conservation and Recovery Act.

In the latest installment of a regulatory effort with decades of history, this past December EPA promulgated a RCRA rule for coal ash of all types. Therein the agency decided to regulate coal ash under Subtitle D, governing solid waste like household trash, rather than Subtitle C, governing hazardous waste, though EPA may revisit this determination later. Under RCRA's Bevill Amendment, EPA based this decision on eight factors, some scientific ("potential danger, if any, to human health

and the environment"), and some economic ("the costs of such alternatives"). Clearly, EPA had very broad discretion. But given the gravity of the problem, it seems to me that the agency improperly exercised its latitude.

Science has a role in this rulemaking, but not a decisive one. This is as it should be. Fossil fuels generally, and coal in particular, are at the very core of our industrial society. Coal supplies about 40 percent of the energy to power the electric grid. More effective control of coal pollution (also including greenhouse gases) will inevitably reverberate throughout our entire polity. It is proper that society, and not just science, makes this decision.

Science is an extraordinarily powerful tool. But science is also limited to answering a rather narrow set of questions. For example, is mercury toxic? In controlling coal ash, many critical questions are inherently not scientific, but rather legal and political: Who will pay and with what currency — will corporations pay in dollars, or local residents pay with their lives?

EPA's cost-benefit analysis performed in the rulemaking attempts to address some of these broader issues, surprisingly concluding that the cost of these new RCRA regulations exceed the benefits by some 2.5 times. Key costs include buying and installing liners for the numerous currently unlined coal ash pits, and monitoring nearby surface and groundwater. EPA also documents dozens of cases in which coal ash has already contaminated water supplies.

Something seems wrong here. We collected the fly ash to keep it out of our air. Yet somehow EPA concludes that it is not cost-effective to also keep it out of our rivers and aquifers. What exactly did the cost-benefit analysis get wrong? Though it quantifies various small-scale costs, benefits, and risks, it entirely overlooks systemic hazards to our entire society from continuing to burn coal.

There is decent archeological and historical evidence that loss of abundant, pure fresh water has contributed to bringing down past societies. The Middle East, once the cradle of civilization, now has salinated soils near the Tigris and Euphrates, and the forests of Lebanon have been turned into deserts. Our highly technological society is without precedent in human history, so in one sense things really are different this time, but so too is the scope of the environmental problems we are creating by continuing to burn coal, including not only massive amounts of toxic coal ash but also greenhouse gases.

Water pollution is often irreversible. Aquifers once polluted stay so. And as the experience on the Hudson River with PCBs shows, some surface water pollution is so expensive and impractical to clean up that it too is effectively irreversible.

Applying Nassim Taleb's ideas developed in the context of financial markets and genetically modified organisms, when we pollute our freshwater supplies, we exercise an option now, foreclosing future options. EPA's cost-benefit analysis entirely overlooks

systemic risks to our society. These systemic risks are effectively outside the ken of science, because they entail risks of one-time events in a society that possesses

energy technology with no historical precedent.

As a scientist, I can understand EPA's decision to not regulate coal ash as hazardous waste, even though it contains manifestly toxic substances. As a citizen, I cannot fathom why any society would willingly bear a risk, however small, that could lead to irreversible and catastrophic loss of critical natural resources.

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Why would society knowingly jeopardize a precious and irreplaceable resource?