Industrial Biomass Burning: Bad for Community and Worker Health

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It always takes a while for academia to officially notice what impacted community members figure out much earlier. In this case, that burning wood and other biomass for energy is bad for human health. Twenty years ago, I organized residents in my home county to successfully stop a wood burning power plant, before they came to be known as biomass power plants (or biomass incinerators, as many of us describe them). We documented the problems with toxic exposure risks as best we could, and that began a journey that resulted in forming Energy Justice Network and helping communities stop several dozen biomass incinerators throughout the U.S. and on four other continents.

The first literature review on the topic, recently published in the *International Journal of Environmental Research and Public Health*,[1] affirmed what we've been documenting over the years, and paved some much-needed new ground in summarizing health impacts on biomass power plant workers.

Most recently, New Hampshire legislators are poised to pass a law that would force electric customers to pay an extra $60-120 per year to subsidize unprofitable biomass plants, in the name of saving jobs. In examining the latest EPA industrial air pollution data, we found that seven biomass incinerators in New Hampshire are among the state's top 14 industrial air polluters, along-side coal power plants and the states only trash incinerator. The biomass plants were all the top air polluters in their counties.

Given this reality, it's not surprising to see a Thai study of community health impacts found that residents living in the vicinity of two small biomass power plants showed an increased risk for suffering from respiratory diseases (asthma, COPD), allergy, and certain symptoms (e.g., itching/rash, eye irritation, cough, stuffy nose, allergic symptoms, sore throat, and difficult breathing). The same pollutants that cause these respiratory problems are the ones being pumped out in large volumes by biomass incinerators in the U.S.

In terms of health impacts to power plant workers, the review appropriately points out that energy generation with biomass is comparable with the fossil fuel industry. On top of these effects you'd expect to see among fossil fuel workers, biomass power plant workers are at increased risk for respiratory diseases. Apparently due to handling rotting, stockpiled wood and wood chips, studies found an association between exposure to endotoxins and fungi and respiratory disorders [asthma, nose symptoms] among workers in biomass-fired power plants. This was significantly associated with chronic bronchitis and wheezing.

For decades now, environmentalists have been pointing out that a polluting facility keeping their emissions within legally permitted limits doesn't mean that there will not be health impacts. We've also been pointing out that exposure to multiple pollutants at once can multiply health impacts, sometimes causing health problems worse than expected from just adding individual exposures. The recent literature review reinforces these points.

Two studies of biomass power plant workers showed that even if recommended threshold limits of all substances are complied with, there are still health impacts due to the combined effects of the various substances. This was found to be true both for exposure to multiple gases (that can lead to an increased risk of respiratory and neurotoxic diseases), and for exposure to multiple metals (that increase risk of cancer, neurologic, and respiratory diseases).

Of course, not all power plants or incinerators stay within permitted limits. Violations are common and are often not detected because only a few pollutants are continuously monitored at the smokestack. Acid gases, particulate matter, toxic metals, dioxins, and other toxic gases can be continuously monitored with modern technology, but are tested only once a year at best, under ideal operating conditions, with the testing run by the plant itself, or their contractors, not an independent entity.

If we regulated motorists like we do power plants and incinerators, it would be like setting a speed limit on highway driving and allowing drivers to drive with no speedometer all year. Once a year, a

speed trap would be set, and drivers would be warned with signs saying "Warning: Speed Trap Ahead." And the drivers brother would be running the speed trap (the companies do their own testing).

Even given this lax state of air monitoring, biomass incinerators are still found to violate standards. In studies of biomass heat and power plants in Finland, proposed worker safety standards for endotoxins, actinobacteria, and fungi were exceeded during plant operation. Workers processing the biomass, prior to burning it, were also exposed to high levels of actinobacteria, bacterial endotoxins, and fungi, as well as to organic dust and volatile organic compounds. The impacts of these dusty work conditions on workers lungs were even able to be detected in their breath, as a specific increased protein pointed to sub-chronic and chronic inflammation of the respiratory tract.

Toxic metals in wood are a surprise to many. Copper, chromium, arsenic, lead, and mercury in painted and treated wood is a known problem when burning construction, demolition and disaster debris. However, fresh wood straight from a forest? Well, we've found surprisingly high levels of metals in that so-called clean wood as well. It turns out that some tree species are exceptionally good at absorbing certain metals from soils and air. Also, toxic metals from fossil fuel burning fall out over forested areas and are absorbed by trees that may be later cut and burned for biomass energy. Metals in normal wood ash have been found to be disturbingly high when tested, and would be classified as hazardous waste in Europe if held to the same ash testing standards as coal ash. This recent review affirms this when pointing out a Finnish study where levels of aluminum, manganese, and lead were high and partly exceeded Finnish occupational exposure limits.

All told, there are many health impacts from industrial wood burning, and the hardest impacts fall on the workers. In summarizing the studies on the topic, this literature review found that exposure to gases risks upper respiratory tract irritation and central nervous system disorders, and that multiple exposure to metals can increase risk of cancer, lower respiratory tract irritation, upper respiratory tract irritation, and central nervous system disorders.

Explaining the connection of chemical exposures to these health effects, the review sums it up well, saying:

"With respect to multiple exposure to gases, upper respiratory tract irritation might be explained by the combined effects of sulfur dioxide, nitric oxide, nitrogen dioxide, ammonia, and hydrogen sulfide, while central nervous system disorders might stem from the combined effects of carbon monoxide and hydrogen sulfide. Regarding multiple exposure to metals, an elevated cancer risk might be due to the combined effects of arsenic, beryllium, cadmium, and lead; central nervous system disorders might be explained by the combined effects of manganese, lead, and selenium; lower respiratory tract irritation by the combined effects of beryllium, cadmium, manganese, and selenium; and upper respiratory tract irritation by the combined effects of aluminium, arsenic, and selenium. According to the study findings, these increased health risks are caused by combined effects of various substances, not by the effect of a single substance."

Clearly, biomass burning should not be considered clean, green, or renewable. We can meet our energy needs without harming workers and communities in ways comparable to fossil fuel burning.

Mike Ewall, Esq. is Founder and Executive Director of Energy Justice Network, a national network supporting grassroots resistance against dirty energy and waste facilities, notably biomass and waste incinerators, coal and natural gas facilities.

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[1] Freiberg, Alice et al. "The Use of Biomass for Electricity Generation: A Scoping Review of Health Effects on Humans in Residential and Occupational Settings." *International Journal of Environmental Research and Public Health* 15.2 (2018): 354. PMC. Web. 3 Sept. 2018. www.ncbi.nlm.nih.gov/pmc/articles/PMC5858423/ Direct link to article here: www.ncbi.nlm.nih.gov/pmc/articles/PMC5858423/pdf/ijerph-15-00354.pdf