MASSACHUSETTS MEDICAL SOCIETY HOUSE OF DELEGATES

Code:	Report: , I-09 ()
Title:	Reducing air pollution and promoting public health by opposing biomass power plants
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Referred to:	Reference Committee MD, Chair

Background

The Commonwealth of Massachusetts is currently allowing the development of large-scale biomass power plants, and offering Renewable Energy Credits to plants that generate electricity from biomass. As of autumn 2009, there are three large-scale plants in the permitting process in Massachusetts, with a combined generation capacity of 135 megawatts (MW). The plants are proposed in Russell (Hampden County), Greenfield (Franklin County), and Springfield (Hampden County). The Russell and Greenfield plants would utilize primarily forest biomass, and the Springfield plant would utilize approximately 80% construction and demolition debris (CDD). These large-scale plants burn over a ton of wood chips a minute, and produce electricity at about 24% efficiency.

Under current state policy, biomass fuel is considered renewable and to have net zero carbon dioxide emissions. Because trees consumed as fuel are assumed to re-grow, and therefore re-sequester carbon dioxide equivalent to that produced during combustion, CO_2 emissions from biomass burning are not counted under the state's greenhouse gas emissions accounting, nor in accounting done under the Regional Greenhouse Gas Initiative (RGGI), a compact among the northeastern states intended to reduce greenhouse gas emissions from the energy generation sector. Biomass electricity generation is incentivized under the Massachusetts Green Communities Act, which mandates that an increasing proportion of the state's power be generated from renewable sources.

If built, the proposed biomass plants will consume more wood for fuel than is currently harvested in Massachusetts on an annual basis.[1] They will provide less than 1% of electricity generation capacity in the state.[2]

The health effects of biomass combustion have been recognized for thousands of years. Particulate air pollution specifically has been recognized a cause of excess mortality since the London Fog episode of 1952 where air pollution resulted in thousands of deaths.[3] Contemporarily, the World Health Organization has estimated particulate air

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[1] Calculations based on fuel requirements compared to forest cutting totals from Massachusetts Department of Conservations and Recreation 2005 Stakeholder Report

[2] Data from the Energy Information Administration show that summer peaking generation capacity in Massachusetts was 13,755 MW in 2007.

[3] W. P. Logan (1953); Mortality in the London fog incident; Lancet I:336-338

pollution to be the 13th leading cause of death globally, accounting for 800,000 deaths annually.

Even with modern emissions controls, biomass plants emit significant amounts of particulate matter, nitrogen oxides, sulfur dioxides, heavy metals, dioxins, and other hazardous air pollutants. All three proposed plants in Massachusetts are located in or near neighborhoods; multiple residences, schools and other sensitive receptors are located in the zones of highest air pollution impact. If these plants are built, adverse health effects would be expected to increase and life expectancy would be expected to decrease in these communities.

A similar threat to health exists from the promotion of small-scale, community-level biomass plants. While these small-scale plants' fuel requirements are smaller and their efficiency higher when they use combined-heat-and-power technologies, their air pollution emissions tend to be greater per unit energy generated. The Massachusetts Department of Environmental Protection does not have regulatory authority over the emissions from small-scale biomass facilities, so cannot compel adoption of protective technology to control emissions.

Particulates

Particulate air pollution has long been known to be associated with increased cardiopulmonary symptoms, asthma attacks, days lost from work due to respiratory disease, emergency room visits, hospitalization rates, and mortality.[4]

Hundreds of modern epidemiological studies have described an association between elevated particulate air pollution levels and mortality and other adverse health effects.[5] According to a recent analysis in the *New England Journal of Medicine*, the estimated loss of life expectancy in some major Massachusetts cities attributable to particulate air pollution is in the 1 to 2 year range.[6] The health effects of particulate air pollution specifically from wood combustion have been recently reviewed;[7] the evidence

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[4] Rom, W., Markowitz, S. (2006); Environmental and Occupational Medicine; 4th; Lippincott Williams & Wilkins; J. H. Dickey (2000); Part VII. Air pollution: overview of sources and health effects; Dis Mon 46(9): 566-89 American Thoracic Society (1996); Health effects of outdoor air pollution. Committee of the Environmental and Occupational Health Assembly of the American Thoracic Society; Am J Respir Crit Care Med 153(1): 3-50

[5]. D. W. Dockery, C. A. Pope, 3rd, X. Xu, J. D. Spengler, J. H. Ware, M. E. Fay, B. G. Ferris, Jr. and F. E. Speizer (1993); An association between air pollution and mortality in six U.S. cities; N Engl J Med 329(24): 1753-9B. D. Ostro, W. Y. Feng, R. Broadwin, B. J. Malig, R. S. Green and M. J. Lipsett (2008); The impact of components of fine particulate matter on cardiovascular mortality in susceptible subpopulations; Occup Environ Med 65(11): 750-6D. M. Stieb, S. Judek and R. T. Burnett (2002); Meta-analysis of time-series studies of air pollution and mortality: effects of gases and particles and the influence of cause of death, age, and season; J Air Waste Manag Assoc 52(4): 470-84J. Schwartz (1994a); Air pollution and daily mortality: a review and meta analysis; Environ Res 64(1): 36-52J. Schwartz (1994b); What are people dying of on high air pollution days?; Environ Res 64(1): 26-35 W. Dab, S. Medina, P. Quenel, Y. Le Moullec, A. Le Tertre, B. Thelot, C. Monteil, P. Lameloise, P. Pirard, I. Momas, R. Ferry and B. Festy (1996); Short term respiratory health effects of ambient air pollution: results of the APHEA project in Paris; J Epidemiol Community Health 50 Suppl 1(s42-6U. S. Environmental Protection Agency (2004); Air quality criteria for particulate matter

[6] C. A. Pope, 3rd, M. Ezzati and D. W. Dockery (2009); Fine-particulate air pollution and life expectancy in the United States; N Engl J Med 360(4): 376-86.

[7] L. P. Naeher, M. Brauer, M. Lipsett, J. T. Zelikoff, C. D. Simpson, J. Q. Koenig and K. R. Smith (2007); Woodsmoke health effects: a review; Inhal Toxicol 19(1): 67-106

supports the assertion that wood smoke contributes to respiratory morbidity and mortality.

Massachusetts is close to being out of attainment with EPA's 24-hour standard for PM2.5 which already is inadequate to protect the public health. Particulate matter emissions from the three biomass plants proposed in western Massachusetts will be 183 tons per year,[8] representing a 25% increase in emissions from stationary sources in Franklin, Hampshire, and Hampden Counties, using 2005 EPA data as a baseline. These emissions would contribute to the total atmospheric loading of fine particles.

NO_x, VOCs, and Ozone Formation

Ozone air pollution is formed in the atmosphere from nitrogen oxides (NO_x) and volatile organic compounds (VOCs) in a reaction driven by ultraviolet light. It is one of the principal components of summer smog. Ozone is a highly reactive oxidant gas which reacts in the pulmonary airways causing symptoms of chest pain, shortness of breath, cough, wheeze, increased susceptibility to infection, declines in lung function, increases in asthma attacks, increases in asthma medication use, increased rates of emergency room visits for respiratory disease. Ozone increases asthmatic reactivity to the allergens to which they are sensitive.[9]

The western Massachusetts region is designated as a non-attainment zone for EPA's maximum daily 8-hour average ozone concentration, and EPA modeling anticipates that climate change will increase ambient ozone levels approximately 2 to 8 ppb in the future. Climate sensitivity of ozone will be greatest during peak pollution episodes, producing substantially greater increases at these times than for the seasonal average.[10]

Nitrogen oxide emissions from the three proposed biomass plants will be about 495 tons per year,[11] representing at least an 11% increase in emissions from stationary sources in Franklin, Hampshire, and Hampden counties as estimated from 2005 EPA data. Emissions of VOCs from the plants will be 82 tons per year, representing an 8% increase over stationary source emissions in the three counties.

Metals and dioxins/furans

Lead contamination contributes to developmental neurological damage in children. More than half of Massachusetts lakes now have mercury advisories warning that fish are not safe to eat because of their high mercury content. Additional mercury burden will exacerbate the risk of neurodevelopmental toxicity in children. Some northeastern U.S. wells already contain arsenic levels in excess of what the EPA considers safe. Dioxins/furans are persistent, bioaccumulative, and toxic chemicals that are by-products of chemical manufacturing and combustion. They are known to affect hormone levels and functions, as well as fetal development, the immune system, and reproduction.

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[8] Summed emissions from biomass plant permitting documents submitted to the Massachusetts Department of Environmental Protection.

[9] W. Rom, Markowitz, S. (2006); Environmental and Occupational Medicine; 4th; Lippincott Williams & Wilkins.

[10] U.S. Environmental Protection Agency. 2009. Assessment of the impacts of global change on regional U.S. air quality: a synthesis of climate change impacts on ground-level ozone. EPA/600/R-07/094F. April, 2009.

[11] Emissions numbers from the three plants obtained from environmental permitting documents submitted to the Massachusetts Department of Environmental Protection.

Biomass combustion, especially that of construction and demolition waste, is a source of lead, mercury, arsenic, copper, and chromium pollution, as well as other air pollutants. The three proposed biomass plants will emit hundreds of pounds of lead each year. Emissions of mercury from the proposed plants to the atmosphere will be higher, per unit of energy produced, than is currently allowed from coal plants.[12] The Springfield plant, which will burn CDD, proposes to emit a level of arsenic that is 51% of the state's Threshold Effects Level (TEL). Hexavalent chromium emissions will be 41% of the Allowable Ambient Limit (AAL) the state's annual ambient health limit, at the Springfield plant.[13]

Dioxin/furan emissions at the Springfield plant will be 41% of the Massachusetts AAL; dioxin/furan emissions at the Greenfield plant will be 38% of the AAL. Dioxin/furan emissions were not reported for the Russell plant but are likely to be similar to or greater than those from the Greenfield plant.

Diesel use and emissions

Diesel particulate matter (DPM) is recognized as an especially toxic form of PM2.5, and is implicated in a range of health effects. If the three biomass plants are built, diesel particulate matter emissions from biomass harvesting and transport will be significant. Wood harvesting activities and transport will require between one and two gallons of diesel fuel per ton of wood fuel delivered to a biomass power plant. Diesel emissions from transport alone will produce thousands of tons of CO_2, over 130 tons of NO_x, and more than three tons of diesel particulate matter each year.[14]

Biomass power plant siting and environmental justice considerations

The Massachusetts Environmental Justice policy is designed to help ensure protection of low-income and minority communities from environmental pollution as well as promote community involvement in planning and environmental decision-making, with the goal of maintaining and enhancing the environmental quality of their neighborhoods. However, two of the proposed biomass plants, in Greenfield and Springfield, are located in areas the state has identified as including environmental justice communities. The Massachusetts Department of Public Health Bureau of Environmental Health (BEH) has determined that asthma rates at three schools located close to the proposed Springfield plant, which will burn CDD, are statistically higher than the state average, and that hospitalization rates for asthma for Springfield as a whole are more than twice the statewide rates. The BEH also determined that the prevalence of children in Springfield with blood lead levels of concern is nearly twice the statewide rate.[15]

Climate change and carbon dioxide emissions

Combined "at the stack" CO_2 emissions from the three biomass plants proposed in western Massachusetts will be 1,636,000 tons per year,[16] none of which will be included in state- and regional-level greenhouse gas accounting on the assumption that biomass

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[12] The Clean Air Mercury Rule mandates substantial reductions in atmospheric mercury emissions from coal plants in Massachusetts.

[13] Details on emissions from Palmer Renewable Energy Air Plan Application, revised June 29, 2009.

[14] Diesel use and emissions estimated assuming 25-ton trucks, average round-trip distance for fuel transport, and average emissions factors for diesel NOx and PM.

[15] October 2, 2009 letter from Suzanne Condon, Associate Commissioner Director, Bureau of Environmental Health.

[16] CO2 emissions calculated based on fuel use.

combustion is carbon neutral. International carbon accounting protocols of the Intergovernmental Panel on Climate Change treat forestry activities as a direct and immediate emission of carbon,[17] recognizing intact forests as most effective in storing carbon. Northeastern temperate forests currently serve as an important global carbon sink.[18] At the scale of harvesting required by large-scale biomass plants, however, regrowth of trees to achieve carbon neutrality would take an undetermined amount of time,[19] and there is no public or private oversight to ensure that forests where biomass fuel is sourced will be managed sustainably. Harvesting and combustion of wood for large-scale biomass facilities is therefore likely to degrade forest carbon sequestration and lead to a net emission of greenhouse gases that will contribute to climate warming.

Relevance to MMS Strategic Priorities

The MMS's strategic priorities for 2008–2011 include the following: Improve health care quality, access, equity, and cost effectiveness for the Commonwealth and promote a sound public health system. The recommendations provided in this report are designed to promote public health and prevent adverse health outcomes.

Recommendations:

That the Massachusetts Medical Society urges state government to adopt policies to minimize the approval and construction of new biomass plants, and to instead promote energy efficiency and conservation, and zero-pollutant emissions renewable energy technologies; *(D)*

That the MMS state its opposition to the three currently proposed large-scale biomass power plants in Massachusetts, on the grounds that each facility poses an unacceptable public health risk; *(HP)*

That the MMS urges state government to remove large-scale biomass electricity generation plants from the list of technologies eligible to receive Renewable Energy Credits (RECs), federal stimulus funds, and Massachusetts Technology Collaborative loans, and thereby remove these incentives for their existence; *(D)*

That the MMS urges state government to extend Department of Environmental Protection regulatory authority to small-scale biomass facilities, to ensure that the most protective air pollution emissions controls are utilized. *(HP)*

Fiscal Note: No Significant Impact
(Out of Pocket Expenses)

FTE: Existing Staff
(Staff Effort to Complete Project)

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[17] IPCC Good practice guidance for land use, land-use change, and forestry. IPCC National Greenhouse Gas Inventories Programme. Also, Johnson, E. 2008. Goodbye to carbon neutral: getting biomass footprints right. Environ Impact Asses Rev,doi:10.1016/j.eiar.2008.11.002

[18] Myeni, R.B., et al. 2001. A large carbon sink in the woody biomass of Northern forests. Proceedings of the National Academy of Sciences. 98:14784-14789.

[19] Heavy thinning, including whole-tree removal, is common in harvests conducted for biomass fuel. Forest biomass increases by one to two tons per acre, per year, so recovery from a harvest that removed 20 tons an acre (an average biomass harvest) would take around 20 years.