

1 **MASSACHUSETTS MEDICAL SOCIETY HOUSE OF DELEGATES**

2
3 Code: Report: , I-09 ()
4 Title: Reducing air pollution and promoting public health by opposing
5 biomass power plants
6
7 Sponsor: Committee on Environmental and Occupational Health
8 Robert Naparstek, MD, Chair
9 Jefferson Dickey, MD, MPH
10
11 Referred to: Reference Committee
12 MD, Chair
13

14 Background

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

24
25 Under current state policy, biomass fuel is considered renewable and to have net zero
26 carbon dioxide emissions. Because trees consumed as fuel are assumed to re-grow,
27 and therefore re-sequester carbon dioxide equivalent to that produced during
28 combustion, CO₂ emissions from biomass burning are not counted under the state's
29 greenhouse gas emissions accounting, nor in accounting done under the Regional
30 Greenhouse Gas Initiative (RGGI), a compact among the northeastern states intended
31 to reduce greenhouse gas emissions from the energy generation sector. Biomass
32 electricity generation is incentivized under the Massachusetts Green Communities Act,
33 which mandates that an increasing proportion of the state's power be generated from
34 renewable sources.

35
36 If built, the proposed biomass plants will consume more wood for fuel than is currently
37 harvested in Massachusetts on an annual basis.¹ They will provide less than 1% of
38 electricity generation capacity in the state.²

39
40 The health effects of biomass combustion have been recognized for thousands of years.
41 Particulate air pollution specifically has been recognized a cause of excess mortality
42 since the London Fog episode of 1952 where air pollution resulted in thousands of
43 deaths.³ Contemporarily, the World Health Organization has estimated particulate air

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

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

3
4 Even with modern emissions controls, biomass plants emit significant amounts of
5 particulate matter, nitrogen oxides, sulfur dioxides, heavy metals, dioxins, and other
6 hazardous air pollutants. All three proposed plants in Massachusetts are located in or
7 near neighborhoods; multiple residences, schools and other sensitive receptors are
8 located in the zones of highest air pollution impact. If these plants are built, adverse
9 health effects would be expected to increase and life expectancy would be expected to
10 decrease in these communities.

11
12 A similar threat to health exists from the promotion of small-scale, community-level
13 biomass plants. While these small-scale plants' fuel requirements are smaller and their
14 efficiency higher when they use combined-heat-and-power technologies, their air
15 pollution emissions tend to be greater per unit energy generated. The Massachusetts
16 Department of Environmental Protection does not have regulatory authority over the
17 emissions from small-scale biomass facilities, so cannot compel adoption of protective
18 technology to control emissions.

19 *Particulates*

20
21 Particulate air pollution has long been known to be associated with increased
22 cardiopulmonary symptoms, asthma attacks, days lost from work due to respiratory
23 disease, emergency room visits, hospitalization rates, and mortality.⁴

24
25 Hundreds of modern epidemiological studies have described an association between
26 elevated particulate air pollution levels and mortality and other adverse health effects.⁵
27 According to a recent analysis in the *New England Journal of Medicine*, the estimated
28 loss of life expectancy in some major Massachusetts cities attributable to particulate air
29 pollution is in the 1 to 2 year range.⁶ The health effects of particulate air
30 pollution specifically from wood combustion have been recently reviewed;⁷ the evidence

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 Mouillec, 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

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

3
4 Massachusetts is close to being out of attainment with EPA's 24-hour standard for
5 PM_{2.5} which already is inadequate to protect the public health. Particulate matter
6 emissions from the three biomass plants proposed in western Massachusetts will be 183
7 tons per year,⁸ representing a 25% increase in emissions from stationary sources in
8 Franklin, Hampshire, and Hampden Counties, using 2005 EPA data as a baseline.
9 These emissions would contribute to the total atmospheric loading of fine particles.

10 11 *NO_x, VOCs, and Ozone Formation*

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

20
21 The western Massachusetts region is designated as a non-attainment zone for EPA's
22 maximum daily 8-hour average ozone concentration, and EPA modeling anticipates that
23 climate change will increase ambient ozone levels approximately 2 to 8 ppb in the future.
24 Climate sensitivity of ozone will be greatest during peak pollution episodes, producing
25 substantially greater increases at these times than for the seasonal average.¹⁰

26
27 Nitrogen oxide emissions from the three proposed biomass plants will be about 495 tons
28 per year,¹¹ representing at least an 11% increase in emissions from stationary sources in
29 Franklin, Hampshire, and Hampden counties as estimated from 2005 EPA data.
30 Emissions of VOCs from the plants will be 82 tons per year, representing an 8%
31 increase over stationary source emissions in the three counties.

32 33 *Metals and dioxins/furans*

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

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.

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

10
 11 Dioxin/furan emissions at the Springfield plant will be 41% of the Massachusetts AAL;
 12 dioxin/furan emissions at the Greenfield plant will be 38% of the AAL. Dioxin/furan
 13 emissions were not reported for the Russell plant but are likely to be similar to or greater
 14 than those from the Greenfield plant.

15 *Diesel use and emissions*

16 Diesel particulate matter (DPM) is recognized as an especially toxic form of PM2.5, and
 17 is implicated in a range of health effects. If the three biomass plants are built, diesel
 18 particulate matter emissions from biomass harvesting and transport will be significant.
 19 Wood harvesting activities and transport will require between one and two gallons of
 20 diesel fuel per ton of wood fuel delivered to a biomass power plant. Diesel emissions
 21 from transport alone will produce thousands of tons of CO₂, over 130 tons of NO_x, and
 22 more than three tons of diesel particulate matter each year.¹⁴

23 *Biomass power plant siting and environmental justice considerations*

24
 25 The Massachusetts Environmental Justice policy is designed to help ensure protection
 26 of low-income and minority communities from environmental pollution as well as promote
 27 community involvement in planning and environmental decision-making, with the goal of
 28 maintaining and enhancing the environmental quality of their neighborhoods.
 29 However, two of the proposed biomass plants, in Greenfield and Springfield, are located
 30 in areas the state has identified as including environmental justice communities. The
 31 Massachusetts Department of Public Health Bureau of Environmental Health (BEH) has
 32 determined that asthma rates at three schools located close to the proposed Springfield
 33 plant, which will burn CDD, are statistically higher than the state average, and that
 34 hospitalization rates for asthma for Springfield as a whole are more than twice the
 35 statewide rates. The BEH also determined that the prevalence of children in Springfield
 36 with blood lead levels of concern is nearly twice the statewide rate.¹⁵

37 *Climate change and carbon dioxide emissions*

38
 39 Combined "at the stack" CO₂ emissions from the three biomass plants proposed in
 40 western Massachusetts will be 1,636,000 tons per year,¹⁶ none of which will be included
 41 in state- and regional-level greenhouse gas accounting on the assumption that biomass
 42

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 NO_x 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.

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

11
 12 Relevance to MMS Strategic Priorities

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

17
 18 Recommendations:

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

23
 24 **That the MMS state its opposition to the three currently proposed large-scale**
 25 **biomass power plants in Massachusetts, on the grounds that each facility poses**
 26 **an unacceptable public health risk; (HP)**

27
 28 **That the MMS urges state government to remove large-scale biomass electricity**
 29 **generation plants from the list of technologies eligible to receive Renewable**
 30 **Energy Credits (RECs), federal stimulus funds, and Massachusetts Technology**
 31 **Collaborative loans, and thereby remove these incentives for their existence; (D)**

32
 33 **That the MMS urges state government to extend Department of Environmental**
 34 **Protection regulatory authority to small-scale biomass facilities, to ensure that the**
 35 **most protective air pollution emissions controls are utilized. (HP)**

36
 37 Fiscal Note: No Significant Impact
 38 (Out of Pocket Expenses)

39
 40 FTE: Existing Staff
 41 (Staff Effort to Complete Project)

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.