August 7, 2017

Michael Judge
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Massachusetts Department of Energy Resources
100 Cambridge Street, Suite 1020
Boston, MA 02114

Submitted via email to thermal.doer@state.ma.us

Re: Joint Comments on Revised Proposed Changes to Alternative Portfolio Standard Regulations (225 CMR 16.00)

Dear Director Judge:

On behalf of the undersigned organizations, we submit the attached comments on the revised proposed changes to the Alternative Portfolio Standard Regulations (225 CMR 16.00) to include renewable thermal in the Massachusetts Alternative Renewable Energy Portfolio Standard (APS), pursuant to Chapter 251 of the Acts of 2014 and Chapter 188 of the Acts of 2016.

Our organizations represent tens of thousands of Massachusetts residents from across the state who will be impacted by these regulations, through proximity to logging operations, exposure to pollutants from combustion of biomass and waste, as ratepayers who will finance APS credits, and as citizens who are affected by climate change. Several of our groups were intimately engaged in the development of Massachusetts' landmark 2012 regulations governing the inclusion of biomass in the Massachusetts Renewable Energy Portfolio Standard (RPS), which are widely considered the most advanced in the nation.

The attached comments are being submitted in response to the revised Draft 225 CMR 16.00 regulations (the "revised draft regulations") filed by the Massachusetts Department of Energy Resources (DOER) on June 2, 2017. These comments are in addition to the previous comments our groups submitted jointly and individually to the administrative record on the initial draft 225 CMR 16.00 regulations that were released in 2016; they do not replace them. Unless otherwise noted, to the extent that our previous recommendations were not accepted and the draft regulations changed accordingly, our original concerns still stand.

For the purposes of these comments, our focus is on revisions to the draft regulations pertaining to "Eligible Biomass Woody Fuel" and "Manufactured Biomass Fuel" and new provisions added to the draft regulations on "Thermal Waste-to-Energy." Organizations may be submitting comments separately on other aspects of the proposed changes.

Since submitting comments on these regulations a year ago, our overarching concern that these regulations will lead to significant adverse impacts on the environment has not changed; indeed,

the revised draft regulations and associated guidelines provide even weaker protections than the initial draft.

Furthermore, newly-available federal data show that Massachusetts already has the highest levels of particulate pollution in New England from residential wood-burning. According to the National Emissions Inventory, biomass combustion accounted for 83% of all $PM_{2.5}$ emissions from heating in Massachusetts in 2014, and a quarter of the state's total $PM_{2.5}$ emissions. The state should not be using clean energy funds to support more biomass pollution. Our comments focus on five main areas of concern:

- Sustainability Standards: The proposed standards for sustainable forestry are far weaker than those adopted in 2012 for the Renewable Portfolio Standard (RPS), even though the ecological impacts of forest biomass harvesting are the same regardless of whether the wood is burned for electricity or for heat.

- Greenhouse Gas Emissions: The draft regulations will allow increased greenhouse gas emissions in Massachusetts for decades, and DOER has failed to conduct a life-cycle analysis of the climate change impacts resulting from incentivizing more biomass combustion. We are submitting separate files to provide documentation on this point.

- Toxics and Air Pollution: The emissions standards are lax and do not adequately protect Massachusetts residents from conventional air pollutants such as fine particulates. These regulations would provide incentives to technologies that will fail to meet EPA standards in two years.

- Thermal Waste-to-Energy: The revised regulations now allow garbage incinerators that produce steam to be eligible for the APS. Like biomass, garbage incineration is more polluting than fossil fuels per unit of energy generated and should not receive clean energy credits.

- Existing Law and the Enabling Statute: The draft regulations fail to meet the stringent criteria for biomass harvesting and burning set forth in the enabling statute and are inconsistent with the goals of other state laws, such as the 2008 Global Warming Solutions Act.

The revised draft 225 CMR 16.00 regulations continue to be fundamentally flawed and incompatible with the stated goals of the APS and other Massachusetts programs designed to support clean energy and reduce greenhouse gas emissions. We urge DOER to remove Eligible Biomass Woody Fuel, Manufactured Biomass Fuel, and Thermal Waste to Energy from the program until such time as DOER corrects the flaws evident in the draft regulations. Any new program must comply with existing law, protect environmental justice communities, and meet if not surpass the State's goals under the Global Warming Solutions Act.

Thank you for your consideration,

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American Lung Association

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ARISE

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Buckland Board of Health

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Table of Contents

Introduction

Our organizations oppose granting renewable or alternative energy subsidies or incentives to energy from polluting fuels and technologies. Programs incentivizing alternative energy should help reduce greenhouse gas and air pollution emissions. At a minimum, they should not incentivize technologies that are worse than the traditional energy technologies they replace. As noted extensively in our joint comments on the initial draft regulations,[1] burning biomass emits significantly more carbon pollution than burning fossil fuels per unit of energy, and harvesting trees for fuel reduces the ability of forests to take carbon out of the atmosphere.[2] Similarly, emissions from waste-to-energy (WTE) facilities combusting municipal solid waste (MSW) are higher than fossil-fuel fired facilities for both greenhouse gas emissions[3] and criteria and hazardous air pollutants, [4] on a per megawatt-hour (MWh) basis.

A lot has changed since 2014, when modifying the APS was first proposed, and since a year ago, when we commented on the previous draft regulations. Even as greenhouse gas emissions have stabilized, global atmospheric CO_2 levels are continuing to increase at record levels, suggesting that the ability of the Earth's natural systems to absorb CO_2 may be diminishing. In this context, the urgency of ceasing emissions becomes more clear by the day.[5] Furthermore, new work is continually emerging that shows the effects of air pollution on populations, and the micro-effects of small changes in air pollution on physiological function. For instance, a 2017 study of health impacts of air pollution found that residential combustion causes around 10,000 premature deaths per year in the US from particulate matter and ozone exposure, which is about half the 21,000 addition deaths that occur due to power plant pollution. About 390 of these annual deaths from residential fuel combustion occur in Massachusetts.[6] A 2017 Canadian

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[1] These comments incorporate by reference joint comments submitted to DOER on June 30, 2016 by the following organizations: Conservation Law Foundation Massachusetts; Woods Hole Research Center; Environmental League of Massachusetts; Toxics Action Center; Partnership for Policy Integrity; Massachusetts Sierra Club; RESTORE: The North Woods; and W.E.S.T (hereinafter referred to as the 2016 "joint comments").

[2] Thomas Walker et al., Manomet Center for Conservation Sciences, *Biomass Sustainability and Carbon Policy Study* (2010) (hereinafter "Manomet").

[3] N.Y.S. Department of Environmental Conservation, "*Beyond Waste: A Sustainable Materials Management Strategy for New York State*," Dec. 27, 2010.

[4] Steven C. Russo, Esq., et al., Comments of the New York State Department of Environmental Conservation Regarding the Verified Petition of Covanta Energy Corporation, In the Matter of the Application of Covanta Energy Corporation for Modification of the List of Eligible Resources Included in the Main Tier of New York's Renewable Portfolio Standard Program to Include Energy From Waste Technology, State of New York Public Service Commission, Case 03-E-0188, August 19th, 2011.

[5] https://www.nytimes.com/2017/06/26/climate/carbon-in-atmosphere-is-rising-even-as-emissions-stabilize.html?_r=0).

[6] Penn, S. L., S. Arunachalam, M. Woody, W. Heiger-Bernays, Y. Tripodis and J. I. Levy (2017). "Estimating State-Specific Contributions to PM(2.5)- and O(3)-Related Health Burden from Residential Combustion and Electricity Generating Unit Emissions in the United States." Environmental Health Perspectives **125**(3): 324-332.

study identified the chemical signature of biomass burning contribution to $PM_{2.5}$ and found that short-term changes in PM concentrations are associated with hospital admissions for myocardial infarction among elderly subjects in areas impacted by biomass burning. The effect occurred at relatively low levels of ambient PM pollution (Figure 1).[7]

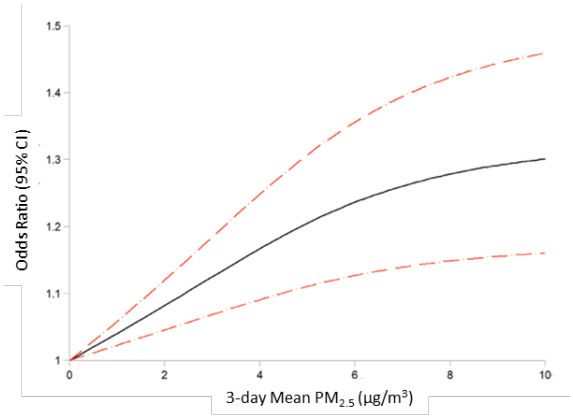

Figure 1. Concentration–response relationship between 3-day mean ambient $PM_{2.5}$ concentrations (using a restricted cubic spline with three knots) and hospital admissions for myocardial infarction among elderly subjects (from Weichenthal, et al. 2017).

At the other end of the scale, examining the micro-effect of wood smoke on cellular processes, another recent study found "atmospherically relevant" doses of wood combustion particles deposited on bronchial epithelia significantly increased cell death.[8]

We don't know yet what the actual price of the APS thermal subsidies will be, but indications are the subsidies could be a significant windfall for individual biomass units. For instance, New Hampshire's thermal APS program has paid around $25 per MWh equivalent of thermal energy.[9] Taking for instance a 2.5 MMBtu biomass boiler assumed to operate at 85 percent efficiency for five months a year, this could amount to $56,814 in payments per year for that single unit alone. This is a lot of ratepayer support for a technology that worsens greenhouse gas (GHG) emissions over decades and demonstrably emits air pollution that can sicken and even kill.

With the federal government back-pedaling on addressing critical issues of air pollution and climate change, states like Massachusetts must lead the way in protecting our environment and our climate. Massachusetts should not be incentivizing any technologies that increase air pollution or contribute to climate change.

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[7] Weichenthal, S., et al (2017). "Biomass Burning as a Source of Ambient Fine Particulate Air Pollution and Acute Myocardial Infarction." Epidemiology 28: 329-337.

[8] Krapf, M., et al (2017). "Wood combustion particles induce adverse effects to normal and diseased airway epithelia." Environmental Science: Processes & Impacts **19**(4): 538-548.

[9] http://groundenergysupport.com/wp/nh-thermal-recs-need-know/

Our comments below, combined with joint comments previously submitted last year, demonstrate that the draft regulations, even as revised, continue to substantively fail to meet a number of requirements pursuant to Mass. Gen. Laws Ch. 25A § 11F1/2 and fall far below protections contained in other Massachusetts programs, regulations, and guidelines. Accordingly, DOER must remove "Eligible Biomass Woody Fuel," "Manufactured Biomass Fuel," "Thermal Waste-to-Energy" and the related proposed changes from the draft regulations until such time as these shortcomings are remedied.

Sustainability Standards

The proposed regulations do not protect forests

Forestry "residues" – the tops and limbs left over after harvesting of more commercially valuable parts of a tree – are central to DOER's regulations about biomass, because while residues are treated as an eligible biomass fuel, leaving adequate residues onsite following harvesting is essential to preserving soil fertility, preventing erosion, and maintaining wildlife habitat. The legislature made it clear that forest sustainability is mandatory if biomass is to be included in the suite of technologies privileged to receive APS subsidies under the amended legislation, stating biomass is included "provided, however, that facilities using biomass fuel shall be low emission, use efficient energy conversion technologies and fuel that is produced by means of sustainable forestry practices."[10]

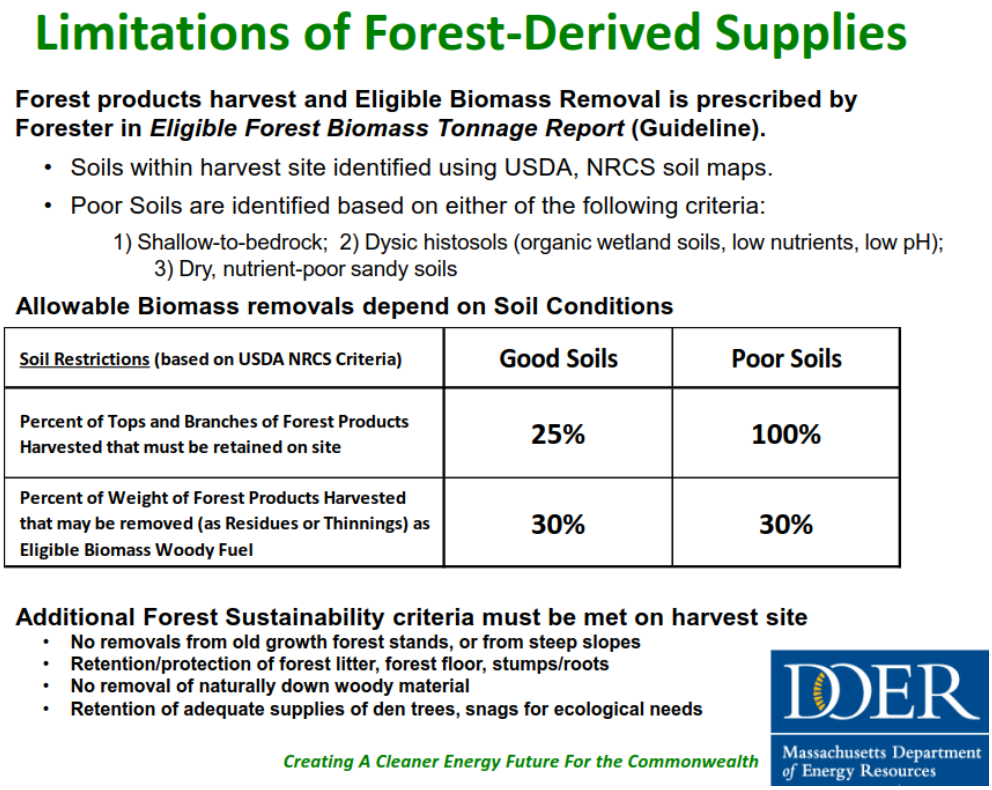
The APS legislation further states that "the department shall adopt any existing or new biomass fuel sustainability standards if deemed appropriate by the department after a public comment process."

However, as we raised in our June 2016 joint comments on the regulations, the draft regulations undermine the forest sustainability standards established for biomass harvesting in Massachusetts in 2012. Further, DOER has failed to conduct an adequate public comment process regarding changes in the standards.

The regulations governing biomass eligibility for renewable electricity credits promulgated in 2012, 225 CMR 14.00 (referred to in these comments as the "2012 biomass regulations") put in place comprehensive guidelines for biomass sustainability, while allowing collection of some residues for fuel. Since the forest does not care if the wood being removed for biomass is going to be burned in an electrical unit generating renewable electricity credits or a thermal unit generating alternative energy credits, there is no reason why the extension of credits to thermal bioenergy under the Alternative Portfolio Standard requires new regulations around forest protection and greenhouse gas emissions. DOER has arbitrarily proposed new forest protection and greenhouse gas emission regulations for the APS that are dramatically weaker than the 2012 biomass 225 CMR 14.00 regulations for RPS, and fundamentally undermine Massachusetts' clean energy and sustainable forestry goals.

[10] https://malegislature.gov/Laws/GeneralLaws/PartI/TitleII/Chapter25A/Section11F1~2

DOER's summary of the 2012 biomass regulations describes the former sustainability provisions:



Limitations of Forest-Derived Supplies

Forest products harvest and Eligible Biomass Removal is prescribed by Forester in *Eligible Forest Biomass Tonnage Report* (Guideline).

- Soils within harvest site identified using USDA, NRCS soil maps.
- Poor Soils are identified based on either of the following criteria:

  1) Shallow-to-bedrock; 2) Dysic histosols (organic wetland soils, low nutrients, low pH); 3) Dry, nutrient-poor sandy soils

Allowable Biomass removals depend on Soil Conditions

Soil Restrictions (based on USDA NRCS Criteria)	Good Soils	Poor Soils
Percent of Tops and Branches of Forest Products Harvested that must be retained on site	25%	100%
Percent of Weight of Forest Products Harvested that may be removed (as Residues or Thinnings) as Eligible Biomass Woody Fuel	30%	30%

Additional Forest Sustainability criteria must be met on harvest site

- No removals from old growth forest stands, or from steep slopes
- Retention/protection of forest litter, forest floor, stumps/roots
- No removal of naturally down woody material
- Retention of adequate supplies of den trees, snags for ecological needs

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Figure 2. DOER's summary of forest protections under the 2012 biomass regulations

These regulations are also spelled out in the *Massachusetts Forestry Best Management Practices Manual* published by the Department of Conservation and Recreation (DCR).[11]

The proposed regulations lack accountability and enforceable standards

Essential to the concept of accountability under the 2012 biomass regulations was tracking of biomass shipments with a certificate system. Given that these fuels can generate millions of dollars in ratepayer-funded subsidies for biomass plants, this level of accountability is the minimum that should be required. For instance, in 2013, when biomass electricity plants in Maine were still receiving RECs from Massachusetts, the price paid to plants for generating one megawatt-hour of electricity was about $63. Assuming typical plant efficiency, burning one ton of wood would generate around $38 - $42 in subsidies from Massachusetts electricity ratepayers, and at full operation, burning hundreds of thousands of tons of wood per year, a plant could receive over $10 million in renewable energy subsidies per year. It is imperative that DOER establish clear and enforceable standards to ensure that APS credits do not go to support fuels and technologies that harm forests, public health, and the climate.

[11] http://www.mass.gov/eea/docs/dcr/stewardship/forestry/ma-forestry-bmp-manual-rd.pdf

The importance and centrality of the certificate system to forest sustainability and greenhouse gas accounting was demonstrated by it being set forth in the 2012 regulations – not the guideline. The 2012 regulations stated:

*For Forest Derived Residues and Forest Derived Thinnings, the Eligible Forest Biomass Tonnage Report shall also include a certification from the professional forester that no more than the allowable per cent of the total weight of all forest products harvested from a given forest harvest site is prescribed to be removed for utilization as an Eligible Biomass Woody Fuel. The professional forester shall also certify that the prescribed harvest meets the forest sustainability thresholds provided in the Biomass Eligibility and Certificate Guideline. The Eligible Forest Biomass Tonnage Report shall also include (1) the total tons of Eligible Biomass Woody Fuel prescribed for harvesting under the category of Forest Derived Residues, and (2) the total tons of Eligible Biomass Woody Fuel for harvesting under the category of Forest Derived Thinnings. The total weight of the forest products shall be calculated utilizing weight standards by species provided in the Biomass Eligibility and Certificate Guideline. The allowable percent removal limit shall be determined as prescribed in the Guideline to protect soil nutrient retention in varying soil conditions. (*14.05(8)(a)(5), page 21 of 37*)*

In contrast, the APS regulations now under consideration contain *none* of these provisions, and make no reference to sustainability standards other than to state that "*Forest Derived Residues and Thinnings shall only be sourced from forests meeting Sustainable Forestry Management practices, as independently verified through the attestation of a licensed forester or independent certification"* (225 CMR 16.05(4)(g)(2).

The proposed regulations offer the following definition: *"Sustainable Forestry Management. Practicing a land stewardship ethic that integrates the reforestation, managing, growing, nurturing, and harvesting of trees for useful products with the conservation of soil, air and water quality, wildlife and fish habitat, and aesthetics."* (225 CMR 16.02)

This generic and overly-broad definition of sustainability is too general to be useful and is not sufficiently protective. Nor does it impose enforceable standards. It represents a significant weakening of the protections afforded by the 2012 regulations.

Biomass suppliers: DOER will establish and maintain a *"Biomass Suppliers List with manufacturers and retail suppliers of eligible fuel that meets the biomass sustainability and fuel quality requirements. Facilities seeking qualification as APS Renewable Thermal Generation Units using woody biomass will be required to either use fuel from a supplier on the Department's list and keep purchase records or complete an annual report that documents the sustainability of the woody fuel used in the Generation Unit."*[12]

[12] *Guideline on Biomass, Biogas, and Biofuels for Eligible Thermal Generation Units*, p. 2.

Granted, recipients of subsidies under the APS will sometimes be buying biomass from commercial purveyors, not direct from logging operations, as is the case for biomass electricity facilities. But how will the regulations ensure that forest sustainability requirements are met? Given that there are no forest sustainability requirements – because as stated above, the general definition adopted for sustainability is essentially meaningless – the bar is likely to be low. Indeed, DOER states, "*Fuel suppliers and Generation Units will need to demonstrate to the Department's satisfaction the sustainable management of the forest from which woody biomass was sourced to the extent that forest derived biomass is used to manufacture the biomass fuel. Fuel suppliers and Generation Units will need to document the chain of custody from the forest to the retail supplier and on to the end customer.*"[13]

However, no actual demonstration of "sustainability" is required. Instead, according to the accompanying ***Guideline on Biomass, Biogas, and Biofuels for Eligible Thermal Generation Units,*** the following options are sufficient to demonstrate Sustainable Forest Management:

Option 1: A licensed forester attests there is a long term forest management plan and best management practices that implement Forest Guild biomass harvesting guidelines. Massachusetts forests need to have a DCR cutting plan under long term management option.

However, Massachusetts long-term management plans and cutting regulations do not require the protections provided by the 2012 biomass regulations. That is why they were put in place. More on the Forest Guild requirement below.

Option 2: Fuel suppliers can show independent certification through the Forest Stewardship Council (FSC), or the Program for Endorsement of Forest Certification, which includes the Sustainable Forestry Initiative and the American Tree Farm System.

However, these certification systems are notorious for their inconsistencies and spottiness in addressing key forestry issues.[14] For instance, certification under FSC involves auditing forest management, including harvesting, for 10 principles[15] and 57 criteria; however, none of these appear to make specific recommendation on residue retention and soil fertility in Massachusetts. Additionally, the FSC itself acknowledges that its assessment approach is not relevant for greenhouse gas accounting, stating, "*Overall, the carbon impacts of biomass production and use will remain beyond the scope of FSC certification, in particular emissions from production processes beyond the forest.*"[16]

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[13] *Ibid.*

[14] Stupak, I., B. Lattimore, B. D. Titus and C. Tattersall Smith (2011). "Criteria and indicators for sustainable forest fuel production and harvesting: A review of current standards for sustainable forest management." Biomass and Bioenergy 35(8): 3287-3308.

[15] https://us.fsc.org/en-us/what-we-do/mission-and-vision

[16] https://us.fsc.org/en-us/newsroom/newsletter/id/793

DOER turns to the Forest Guild[17] for guidance. The Forest Guild advice on residues retention states, "*In areas that do not qualify as low-nutrient sites, where 1/3 of the basal area is being removed on a 15- to 20-year cutting cycle, it is our professional judgment that retaining 1/4 to 1/3 of tops and limbs will limit the risk of nutrient depletion and other negative impacts in most forest and soil types*."

However, this is so specific, it is arguably inapplicable in the majority of sites. The Forest Guild guidelines are no substitute for the 2012 biomass sustainability guidelines, which refer to Massachusetts-specific soils and ecosystem types to set allowable residue removal levels. In fact, the Forest Guild document states, "We encourage states to identify low-nutrient soil series where biomass harvesting should not occur and those soil series where biomass harvests require particular caution." This is what the 2012 regulations did, but that approach has now been abandoned. DOER should adopt and strengthen the 2012 forest protection guidelines for the APS – not supersede and weaken them.

DOER has not conducted promised reviews

The 2012 biomass regulations contain the following provision, calling for a Forest Impact Assessment:

14.05(8)(b)2. Forest Impact Assessment. Every 5 years, beginning in 2015, the Department, in coordination with DCR, will conduct an assessment of the impacts on Massachusetts and regional forests resulting from biomass fuel removals. The 5-year assessment shall also consider information on the Eligible Woody Biomass Fuel utilized by qualified Generation Units and the extent to which such fuels come from the categories of Non-Forest Derived Residues, Forest Derived Residues, Forest Derived Thinnings, Forest Salvage, and Dedicated Energy Crops. The Department shall use this information to evaluate the appropriateness and accuracy of greenhouse gas accounting from Generation Units utilizing Eligible Woody Biomass Fuel as provided in the Lifecycle Greenhouse Gas Analysis required under 225 CMR 14.05(1)(a)7(f)iii, and as implemented in the Overall Efficiency and Greenhouse Gas Analysis Guideline. Findings from the assessment shall be reported to the Executive Office and made available to the public no later than June 1 of each assessment year. If the Department concludes the findings would likely result in significant impacts on long term forest sustainability or accurate greenhouse gas accounting, the Department shall consult with the Executive Office, MassDEP, and DCR on any changes that may be required by the Department, MassDEP or DCR to maintain long term forest sustainability and climate change mitigation.

Similar if very truncated language was added in the revised draft regulations:

The Department will assess the impact of biomass heating on the region's forests every five years, beginning in 2020 and in coordination with the Forest Impact Assessment under the

[17] Bennett, N. and e. al. (2010). Forest Biomass Retention and Harvesting Guidelines for the Northeast, Forest Guild Northeast Biomass Retention and Harvesting Guidelines Working Group.

Renewable Portfolio Standard Class I, as prescribed in 225 CMR 14.05(8)(b)2., and make program changes as necessary. The Department will report annually on the aggregate woody biomass fuel composition used in qualified APS Renewable Thermal Generation Units. (225 CMR 16.05(4)(g)(6)).

While the promise of a forest assessment is a welcome addition to the regulations, in fact, an assessment is already overdue according to the RPS regulations. The forest assessment should be conducted in 2018, to establish baseline conditions of the region's forests. Only if a baseline is established can change be assessed.

Greenhouse Gas Emissions

The proposed GHG calculations are deficient and will underestimate CO_2 emissions

The enabling statute for the APS states that DOER shall set *"(ii) for eligible biomass, biogas and liquid biofuel technologies, a requirement of 50 per cent reduction in life-cycle greenhouse gas emissions compared to a high efficiency unit utilizing the fuel that is being displaced or, for a new load, a high-efficiency natural gas unit, if natural gas is available at reasonable cost to the site or otherwise the fuel that is most likely to be utilized."*[18]

As we noted in our 2016 comments, the APS regulations fail to meet that standard. For this round of revisions to the regulation, DOER has for the first time published the Excel workbook for calculating greenhouse gas emissions, meaning this is our first opportunity to comment on it.[19] The workbook is based on the workbook used in the 2012 biomass regulations, but contains several problems that ensure the APS draft regulations are not capable of achieving the reductions in net GHG emissions required by the APS statute.

DOER's GHG accounting omits lifecycle emissions in contravention of the APS statute

The APS statute requires a 50 per cent reduction in life-cycle greenhouse gas emissions for bioenergy. Lifecycle emissions are all GHG emissions associated with growing, harvesting, transporting, and transforming a fuel, as well as the emissions from burning that fuel. In the case of biomass, "net" lifecycle emissions can also be calculated over time, including crediting regrowth of forests with taking up carbon, or, crediting emissions that would occur "anyway" if forestry or mill residues were left to decompose instead of being burned for energy.

The regulations advance at least five different types of biomass fuels that will be eligible to receive subsidies – wood pellets, wood chips direct from forestry sources (encompassing "residues" and whole tree "thinnings"), wood chips from non-forestry sources, cordwood (which

[18] https://malegislature.gov/Laws/GeneralLaws/PartI/TitleII/Chapter25A/Section11F1~2

[19] *Guideline on Reduction of Greenhouse Gases for Eligible Renewable Thermal Generation Units Using Eligible Woody Biomass.*

is most likely to be from whole-tree harvesting), and liquid biofuels made from wood feedstock (which could be of any origin). (225 CMR 16.02). These fuels differ in their lifecycle greenhouse gas emissions, not only because they require differing amounts of fossil fuel inputs to bring them to their final state where they are usable as fuel, but because they have different characteristics that affect their net emissions over time. Yet DOER's *Guideline on Reduction of Greenhouse Gases for Eligible Renewable Thermal Generation Units Using Eligible Woody Biomass*, an Excel spreadsheet workbook for calculating biomass greenhouse gas emissions, **does not account for the differing lifecycle emissions of various fuels**. The section from the GHG analysis workbook issued with the 2012 biomass regulations,[20] which *does* account for lifecycle emissions of differing fuels, **has simply been deleted in the current spreadsheet**. Instead of calculating lifecycle emissions for different fuels as required by the statute, the APS workbook uses a *single emissions figure*[21] from the Manomet Study, which represents the combustion emissions and other lifecycle emissions from harvesting green wood chips – a figure that, according to literature values, probably underrepresents even these emissions.[22]

Lifecycle emissions can be a significant proportion of total emissions. For instance, DOER is requiring a partially dried chip where chips are used. As the Biomass Thermal Energy Council noted in their comments to DOER, "*active offsite drying of fuel, which is typically needed to reach the 30% moisture value, actually results in greater total life cycle emissions and energy use*."[23] In their letter to DOER, Froling Energy, a boiler maker, stated "*A wood pellet manufacturer told us that about 15% of the total weight of green chips that they purchase are utilized to drive off the moisture in the wood to be used for pellets*."[24] Froling does not appear to have publicly provided information on the amount of energy required to dry the "precision dried chip" that they themselves are manufacturing and selling in New Hampshire. However, following values from a pellet lifecycle analysis,[25] it requires 1,115 btu to drive off a pound of water. Taking a ton of chips at 45 percent moisture content down to 35 percent moisture content involves driving off about 308 pounds of water, requiring 0.343 MMBtu energy from some source. That source is going to have carbon emissions.

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[20] Spreadsheet at http://www.mass.gov/eea/docs/doer/renewables/biomass/ma-rps-regulation-overall-efficiency-and-ghg-analysis-guideline-doer-081712.xlsx. The section accounting for lifecycle GHG emissions is on the "GHG Analysis" sheet, cell C-23 to F-25. This section does not appear in the current workbook for GHG analysis under the APS.

[21] Cell D-11 at the "Parameters" sheet of the *Guideline on Reduction of Greenhouse Gases* workbook.

[22] Manomet's table (6-6) estimates that lifecycle emissions of harvesting and transporting chips represents around an additional 1 - 2 percent of emissions on top of stack emissions from combusting the wood. A variety of other studies examining use of green chips for biomass suggests that the estimate is closer to 4 percent and above (See, eg, Domke, G. et al (2012). "Carbon emissions associated with the procurement and utilization of forest harvest residues for energy, northern Minnesota, USA." Biomass and Bioenergy **36**: 141-150.; Ortiz, C. A. et al (2016). "Time-dependent global warming impact of tree stump bioenergy in Sweden." Forest Ecology and Management **371**: 5-14; Laganière, J., et al (2017). "Range and uncertainties in estimating delays in greenhouse gas mitigation potential of forest bioenergy sourced from Canadian forests." GCB Bioenergy **9**(2): 358-369.) .

[23] Comment letter from APS docket from BTEC to DOER, June 30, 2016.

[24] Comment letter from APS docket from Froling Energy to DOER, June 30, 2016.

[25] Katers, J. F. and J. Kaurich (2007). Heating fuel life-cyle assessment. Arlington, VA, Pellet Fuels Institute.

Pellet manufacturing emissions can be especially high. The Partnership for Policy Integrity (PFPI) previously informally shared comments with the Department regarding lifecycle emissions of pellets, and will attach those with this letter, along with associated references. The bottom line is that in some cases, manufacturing pellets may require around an additional 25 percent of energy above what is inherent in the fuel, and expending that energy emits CO_2.

DOER has ignored these lifecycle emissions, in contravention to the direct instruction of the APS enabling statute. This is not acceptable.

Use of a single alternative fate assumption for residues underestimates net GHG emissions

Forestry residues are treated by the GHG analysis workbook as a fuel that would decompose anyway if they were not burned for energy. The decomposition rate is controlled by the "k-constant." When one selects a "fast" decomposition k-constant, this reduces the difference in emissions from burning the material for energy, and emissions from letting it decompose. This in turn reduces calculated net GHG emissions in any given year.

The previous version of the workbook, issued with the 2012 biomass regulations, employed a k-constant of 0.126 for forestry residues, which the Manomet study states represents a half-life of around 5 years for "low-diameter" residues –meaning leaves, twigs, needles, up to branches that are a couple inches thick. The APS workbook has adopted this k-constant, as well. However, this value is not at all appropriate for the actual materials burned in thermal wood chip boilers for heat. These small units require very "clean" woodchips such as are derived by chipping larger diameter, debarked logs. Such logs, if they are to be treated as "residues," must be assigned a lower k-constant that reflects their actual decomposition dynamics. Various studies from the Northeast find much lower decomposition constants for larger-diameter materials, for instance 0.0063[26] to 0.031[27] to 0.096.[28] The decomposition constants used in modeling EPA has conducted for New England were 0.053 for softwoods and 0.069 for hardwoods.[29] Using these constants in the DOER GHG calculations increases the carbon debt and timeframe for achieving reductions in net emissions compared to fossil fuels.

Getting the k-constant right is especially important because pellet and chip manufacturers often argue that they are only using residues, even when they are demonstrably using high-diameter

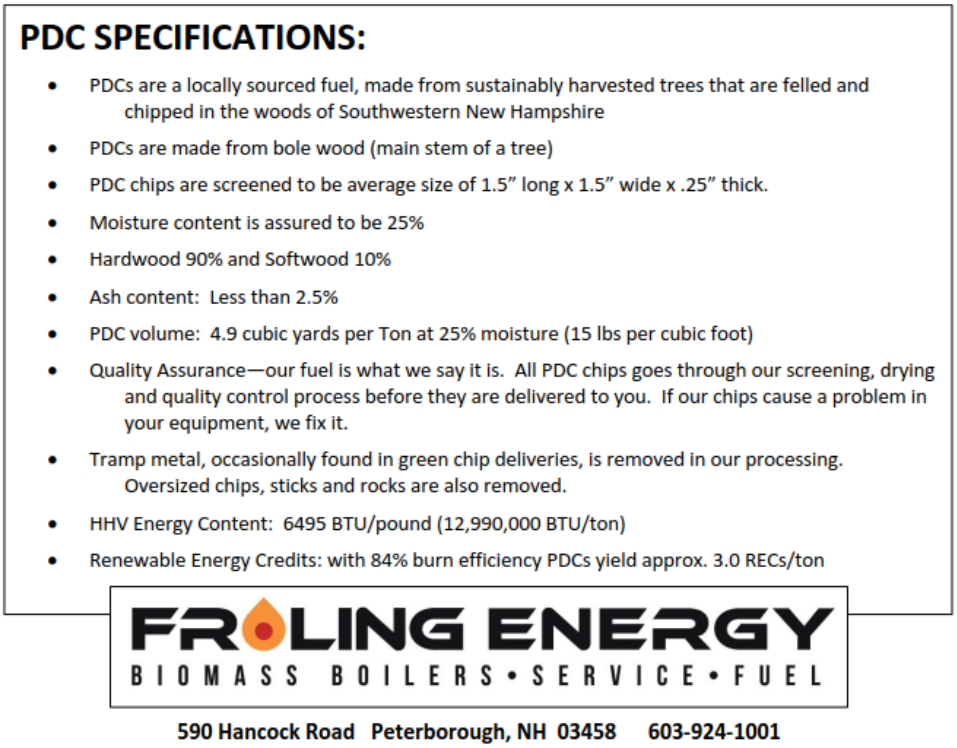
[26] Means, J. E., K. Cromack Jr and P. C. MacMillan (1985). "Comparison of decomposition models using wood density of Douglas-fir logs." Canadian Journal of Forest Research **15**(6): 1092-1098.

[27] Foster, J. R. and G. E. Lang (1982). "Decomposition of red spruce and balsam fir boles in the White Mountains of New Hampshire." Canadian Journal of Forest Research **12**(3): 617-626.

[28] Arthur, M. A., L. M. Tritton and T. J. Fahey (1993). "Dead bole mass and nutrients remaining 23 years after clear-felling of a northern hardwood forest." Can. J. For. Res. **23**.

[29] Beach, R. H., et al (2010). Model Documentation for the Forest and Agricultural Sector Optimization Model with Greenhouse Gases (FASOMGHG). Prepared for Sara Bushey Ohrel, U.S. Environmental Protection Agency. RTI International, Research Triangle Park, NC 27709

materials that would probably not be simply left in the field if there were no biomass market. Sometimes, however, there are indications of true industry practice. For instance, Froling Energy's brochure[30] for their precision dried chip states the chips are from whole (mostly hardwood) trees harvested specifically for energy:



PDC SPECIFICATIONS:

- PDCs are a locally sourced fuel, made from sustainably harvested trees that are felled and chipped in the woods of Southwestern New Hampshire
- PDCs are made from bole wood (main stem of a tree)
- PDC chips are screened to be average size of 1.5" long x 1.5" wide x .25" thick.
- Moisture content is assured to be 25%
- Hardwood 90% and Softwood 10%
- Ash content: Less than 2.5%
- PDC volume: 4.9 cubic yards per Ton at 25% moisture (15 lbs per cubic foot)
- Quality Assurance—our fuel is what we say it is. All PDC chips goes through our screening, drying and quality control process before they are delivered to you. If our chips cause a problem in your equipment, we fix it.
- Tramp metal, occasionally found in green chip deliveries, is removed in our processing. Oversized chips, sticks and rocks are also removed.
- HHV Energy Content: 6495 BTU/pound (12,990,000 BTU/ton)
- Renewable Energy Credits: with 84% burn efficiency PDCs yield approx. 3.0 RECs/ton

Figure 3. Froling Energy's brochure for their "precision dried chip," showing use of bole wood.

The timeframe for assessing net bioenergy GHG emissions is too long

Calculating net greenhouse gas emissions from bioenergy, as the DOER *Guideline on Reduction of Greenhouse Gases* workbook does, requires assessing change over time. The 2012 biomass regulations (225 CMR 14.00) were promulgated pursuant to M.G.L. c. 25A, § 11F, the Massachusetts Renewable Energy Portfolio Standard (RPS). The RPS states that biomass receiving renewable electricity credits should be "advanced, low emissions" bioenergy, and in regulations, set a 20-year timeframe for reducing biomass GHG emissions compared to fossil fuels. However, with recent publication of the *Guideline on Reduction of Greenhouse Gases* calculations workbook we can now see that DOER is proposing a **timeframe of 30 years for the APS**, which ensures that more biomass carbon pollution will be pumped into the atmosphere under these rules than if the RPS standard of 20 years had been maintained.

[30] http://www.frolingenergy.com/wp-content/uploads/2015/11/Froling-Energy-PDC-Brochure-Specifications.pdf

Since 2012 when the more protective regulations were enacted, the news about climate change has worsened. We now know that global warming is happening even faster than we thought, and that we have even less time to reduce emissions to avoid catastrophic global warming. The 20-year timeframe of the 2012 regulations is itself much too long – thus, increasing it by 50 percent to 30 years, as currently proposed, is unacceptable. As a recent *Washington Post* article[31] summarizing work of some climate researchers states:

"The world, they calculate, probably has a maximum of 600 billion remaining tons of carbon dioxide that can be emitted if we want a good chance of holding the rise in planetary temperatures within the Paris limit of 1.5 to 2 degrees Celsius (2.7 to 3.6 degrees Fahrenheit).

With 41 billion tons emitted every year from energy consumption and other sources, such as deforestation, ***there are only about 15 years before that budget is exhausted****.*

…But if emissions are not on a significant downward path by 2020, the logic is inevitable — it gets increasingly difficult to control global warming*. The reason is simple. The later emissions reach their peak, the more rapidly they would have to decline following that peak. At some point it becomes impossible to cut emissions as fast as would be necessary to avoid busting the limited carbon "budget.""*

In recognition of the perils of climate warming, Massachusetts enacted the 2008 Global Warming Solutions Act (GWSA), which mandates that the State establish declining CO_2 emissions levels annually. Simultaneously, the APS regulations call for annual increases in the minimum percentage of annual electrical energy sales with APS alternative generation attributes (225 CMR 16.07) Properly designed, the APS could help the State achieve its GHG emissions reduction goals.

To do so, however, the standard must be set at **no more than 20 years**, and should in fact be even shorter, given the many deficits in accounting for the full GHG impact of bioenergy. We propose a timeframe of 10 years for net bioenergy carbon accounting to be calculated, although arguably, the need for climate mitigation is so dire, the carbon benefit should be instantaneous.

Verification standards for pre-approved biomass suppliers are lacking

While DOER states that for the time being, it will collect information on sources of chips burned by individual units, the department is abandoning this approach for pellets in favor of approving pellet suppliers. The *Guideline on Biomass* states, "*All Generation Units which purchase fuel from a fuel supplier on the Department's Biomass Suppliers list are assumed to have met the requirement for a 50% reduction in lifecycle GHG emissions and* ***are not required to provide any further analysis****, unless requested by the Department.*"[32]

[31] https://www.washingtonpost.com/news/energy-environment/wp/2017/06/29/these-experts-say-we-have-until-2020-to-get-climate-change-under-control-and-theyre-the-optimists/?utm_term=.e8cc912e10c2

[32] *Guideline on Biomass, Biogas, and Biofuels for Eligible Thermal Generation Units*, p. 4.

DOER has provided a convenient table for wood pellet manufacturers that tells them what fuel mix DOER will approve as meeting the GHG criteria – Table 1, showing "Minimum combined percentage of Forest Derived Residues, Non-Forest Derived Residues, and Forest Salvage." However, these percentages are incorrect, because as shown above, DOER's approach to calculating lifecycle greenhouse gas emissions is incorrect.

DOER has not shown how they will verify what the true sources of wood used for pellet manufacture are. We already know that many pellet manufacturers are using whole trees. What will be DOER's procedure for verifying and monitoring the sources of wood used to make pellets? What is the penalty to pellet manufacturers for misrepresenting the sources of wood that they use?

DOER has not assessed the GHG and forest consequences of the biomass policy

Subsidies are generally put in place to encourage adoption of a technology. In the case of cutting trees for bioenergy, the technology being encouraged here, most would agree that heavy forest cutting would harm the climate. But what about moderate forest cutting, or light forest cutting? What increase is "acceptable"? Does DOER even know? We see no evidence that DOER has critically assessed the potential outcomes of its policies.

In fact there is no dispute that installing more wood burners in Massachusetts will increase the flux of CO_2 to the atmosphere from burning wood over a period of decades. DOER's adoption of a 30-year assessment timeframe, instead of the 20-year timeframe of the 2012 regulations, admits as much. This is particularly the case because net CO_2 emissions from bioenergy are "front-loaded" – the largest net emissions occur at the beginning of the lifecycle of a unit. Thus, the more successful the subsidy program is, and the more wood-burning units that come online each year, the larger that frontloaded "bubble" of CO_2 pumped into the atmosphere will become, where it will contribute to warming while awaiting uncertain offsetting in the coming decades. The offsetting is especially uncertain because there is no provision anywhere that ensures that trees are actually required to grow back (this alone is enough to invalidate the underpinning of treatment of bioenergy as "reducing" emissions).

In 2016, the Massachusetts Superior Court interpreted the mandate under the Massachusetts Global Warming Solutions Act that Department of Environmental Protection (DEP) was to promulgate regulations pursuant to M.G.L. ch. 21N § 3 (d) "*establishing a desired level of declining annual aggregate emission limits for sources or categories of sources that emit greenhouse gas emissions*" as meaning that the department needed to limit aggregate emissions from regulated sources, and set declining emissions limits. The court determined that programs that contributed to declining emissions in terms of declining emission rates, but that still did not ensure aggregate emissions did not increase, did not comply with § 3 (d). DOER may argue that their bioenergy calculations demonstrate a "reduction" in greenhouse gas emissions from bioenergy compared to fossil fuels, but even if this stands (and we do not believe it should,

based on the flawed accounting shown above) this still expresses emissions in relative terms – and not in the absolute terms required by the Court's decision, which calls for setting emissions caps that decline in real and absolute terms.

Bioenergy should not have been included in the thermal APS and its inclusion is incompatible with the Court's decision, until and unless the DEP sets declining rates for this source, which should be implemented prior to implementing a program which incentivizes technologies that increase CO_2 emissions.

Credits should not be granted to low efficiency units

The APS statute specifically mentions efficiency, stating that biomass can be included "provided, however, that facilities using biomass fuel shall be low emission, use efficient energy conversion technologies and fuel that is produced by means of sustainable forestry practices." However, the APS guidelines set an efficiency level of just 40 percent for a renewable thermal generation unit that is a combined heat and power facility to be eligible for Alternative Energy Credits (*Guideline on Metering and Calculations for Intermediate and Large Units*, at page 10). This standard falls far short of what would be considered an "efficient" bioenergy technology. As EPA states in a publication on biomass combined heat and power from ten years ago, "*By using waste heat recovery technology to capture a significant proportion of heat created as a byproduct in electricity generation, CHP systems typically achieve total system efficiencies of 60 to 80 percent for producing electricity and thermal energy*."[33] The 40 percent criteria does not reach the standard set by the 2012 biomass regulations, which established that to be eligible for renewable electricity credits, a biomass unit must operate at 50 percent efficiency or above (40 percent for "Advancement of Biomass Conversion" units). Setting the efficiency standard at 40 percent under the APS will simply funnel public subsidy funds to low-performing units, the exact opposite of what a program that is legally mandated to incentivize 'best in class" units should do. The degradation in the efficiency standard relative to the 2012 biomass regulations represents a weakening of environmental protections because it will serve to increase the amount of air pollution and GHG pollution emitted per unit of useful energy, compared to emissions under a more rigorous efficiency standard.

Credits should not be granted for co-firing

The APS statute states that an "alternative energy generating source'' may include biomass, "*provided, however, that facilities using biomass fuel shall be low emission, use efficient energy conversion technologies and fuel that is produced by means of sustainable forestry practices*."[34]

The APS statute does not mention co-firing, but the regulations do. The "co-firing waiver" allows a generation unit that uses an APS ineligible energy source to receive AECs under certain

[33] Energy and Environmental Analysis, Inc. and Eastern Research Group, Inc. Biomass Combined Heat and Power Catalog of Technologies, U. S. Environmental Protection Agency Combined Heat and Power Partnership. September, 2007.

[34] MGL Ch. 25A § 11F1/2(a)(iv).

circumstances when co-firing with another fuel. The most recent proposed revisions to the regulation added useful thermal energy produced from co-firing as potentially eligible to receive AECs, in addition to the electricity from co-firing that was previously eligible (225 CMR 16.05(2)).

The co-firing waiver for electricity is a holdover from the 2009 version of the APS regulations, when units burning "paper-derived fuel" were still eligible to receive AECs. Paper-derived fuel has been removed from the APS, and the co-firing waiver should be, too. The statute makes it clear that "facilities using biomass fuel" (which would include fossil-fired facilities co-firing biomass) "shall" be subject to the requirements above. A fossil-fired plant would not meet the qualifications for "facilities using biomass fuel," even if it were co-firing 80 percent biomass, because it would not be burning fuel that was "low emission" and "produced by sustainable forestry practices."

Since it is both obsolete and counter-productive, DOER should remove the co-firing waiver from the regulations entirely, rather than expand it to include useful thermal energy.

Toxics and Air Pollution

Wood-burning is a major source of fine particulate emissions in Massachusetts. According to the most recent data available from EPA's National Emissions Inventory (NEI), Massachusetts had more $PM_{2.5}$ emissions from residential wood heating in 2014 than any other state in New England, and Worcester County ranked eighth in the nation for county-level emissions (Figure 4).[35]

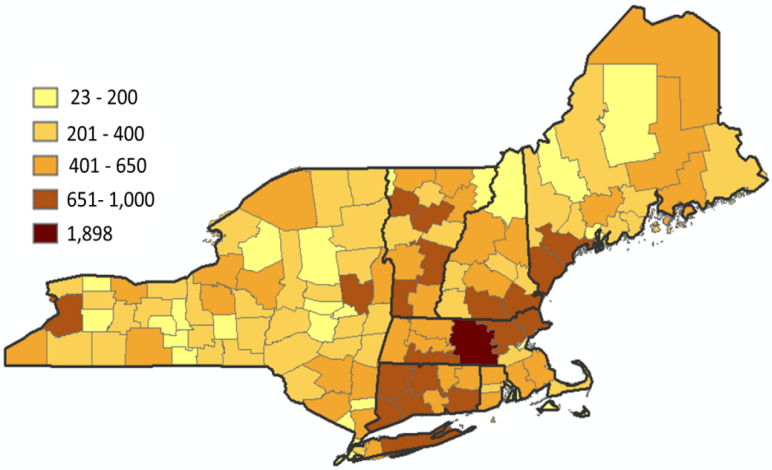


Figure 4. Tons $PM_{2.5}$ from residential wood combustion in New England and New York, by county.

[35] USEPA National Emissions Inventory, https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data, accessed July 31, 2017. See http://www.pfpi.net/massachusetts-tops-northeast-in-air-pollution-from-wood-burning, published 8/1/17, for PFPI analysis.

In Massachusetts, biomass combustion accounted for 83% of all $PM_{2.5}$ emissions from the heating sector (residential and commercial/industrial combined) and a quarter of the state's total $PM_{2.5}$ emissions (Figure 5).

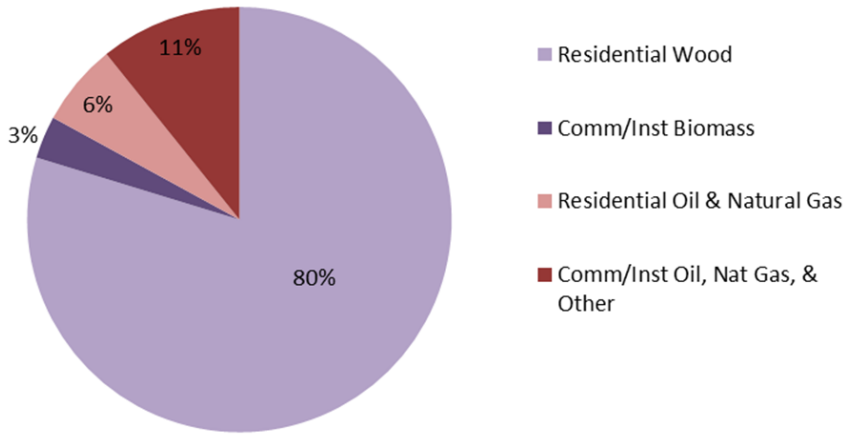


Figure 5. Wood Heating Accounts for 83% of $PM_{2.5}$ emissions from all commercial, industrial and residential heating in Massachusetts

The biomass component of the thermal APS is designed to incentivize the replacement of fossil-fired boilers with wood boilers. As designed, it will drive adoption of a technology that emits hundreds to thousands of times more pollution than the fossil-fueled boilers it replaces, **meaning air pollution loading will increase due to this subsidy program.**

These are not small units, and locally, the effects may be substantial. Figure 6 shows the Vitoflex boiler from Viessman[36], which is available at around 2.15 MMBtu heat input and below.

[36] https://www.viessmann-us.com/en/commercial/biomass-boilers/wood-boilers/vitoflex_300-rf.html

Figure 6. Viessman's Vitoflex boilers, sized ~2.15 MMBtu heat input and below.

AERMOD Analysis conducted for the New York Wood Heat report[37] found that moving from a fossil fuel unit to a wood-fired heating unit will increase concentrations for all pollutants studied. The highest increases in $PM_{2.5}$ emissions were from chip boiler technologies that would be incentivized under the APS program, resulting in emission values that exceeded current National Ambient Air Quality Standards for 24-hour values. The study went on to highlight key components beyond the technology that impact emission outcomes. The report concluded that, "the highest resulting 24-hour average $PM_{2.5}$ levels were from the relatively cleaner burning containerized 2-stage gasification pellet boiler with a 14 ft stack." Maximum operation of these units resulted in levels as high as 48.2 $\mu g/m^3$ (existing conditions included). These results highlight the critical influence factors like stack height can have on ground-level pollution, and how "improper installation can negate potential improvements from cleaner burning technologies."

Such units need tight regulatory oversight, because even when they are operating optimally, they emit more air pollution than a fairly dirty oil burner; when they are operated at low load, or are cycling frequently, they can put out thousands of times more air pollution than fossil-fired boilers. Unfortunately, DOER has proposed toothless regulations that will practically ensure that these units can pollute for long periods of time with impunity.

Wood moisture requirements are not enforceable

The APS draft regulations require chip boilers to use fuels 35% moisture content or less (225 CMR 16.05(g)(1)(ii)). How will this be enforced? Simply, it is not enforceable. Yet the ability of units to meet promised emissions rates *depends* on fuel quality and moisture content. The cordwood provisions are even less realistic. The *Guideline on Biomass* states the wood "*Cordwood fuel in advanced cordwood boilers must be properly dried and seasoned so that the moisture content of the wood is approximately 20%. To properly season the wood, it typically must be dried for at least 2 years. The wood should be stored under cover with sufficient*

[37] Wiess, L., L. Rector, et al. (2016). New York State Wood Heat Report: An Energy, Environmental, and Market Assessment, Final Report. NYSERDA Report 15-26. Prepared for New York State Energy Research and Development Authority. , Northeast States for Coordinated Air Use Management (NESCAUM).

ventilation to allow the wood to dry to approximately 20% moisture content. It is ***imperative that the wood fuel be at moisture content of 20% or below*** *so that good combustion of the fuel is achieved. When wood above 20% moisture content or greenwood is used in advanced cord wood boilers seasonal efficiency decreases significantly while* ***smoke emissions drastically increases***.”[38] Sometimes seasoned cordwood is not available. What is the operator of a unit supposed to do then – simply not run the unit? This is not realistic. Operators are going to burn wet fuels, and units will emit far more pollution as a result.

Particulate matter emission standards are not protective of public health

The enabling statute for the APS requires that:
(b) The department, in consultation with the department of environmental protection, shall set: (i) emission performance standards ***that are protective of public health****, including standards for eligible biomass, biogas and liquid biofuel technologies that limit eligibility only to best-in-class commercially-feasible technologies, inclusive of energy conversion and emissions controls, with regard to reducing emissions of particulate matter sized 2.5 microns or less and carbon monoxide and other air pollutants*;

In our June 2016 comments, we recommended that the particulate pollution standards ($PM_{2.5}$) should at a minimum meet the standards of the SAPHIRE Program, currently set at 0.03 lb/MMBTU/hr. Instead, the standards in the draft remain unchanged at 0.08 lb/MMBTU/hr for pellets and 0.10 lb/MMBTU/hr for wood chips, with DOER having adopted the standard of 0.03 lb/MMBTU/hr for sensitive populations only – like the SAPHIRE program. Having a different standard for “sensitive” and other populations dismisses the reality that “sensitive” populations live everywhere, and include kids with asthma, older people, people with lung and heart disease, people with allergies, and **everyone, on days when ambient air pollution levels are high,** as they often are in the winter. Wood boilers are long-lived technology, and have potential throughout their lifecycle to cause a condition of air pollution even if operated properly. We disagree with the concept of funding projects that produce up to thousands of times more PM than the units they would displace. The SAPHIRE standard is feasible, it is part of a state program, and to not adopt it overall is an abrogation of the responsibility to protect the public’s health that is set out in the enabling APS statute. As we noted in our 2016 comments, even the SAPHIRE program limits do not represent those achievable by “best in class” technologies.

Monitoring and enforcement of emissions do not meet EPA standards

Monitoring and enforcing performance standards for biomass thermal units is highly problematic. The *Guideline on Biomass* states that for boilers between 1 MMBtu/hr and < 3MMBtu/hr that performance testing for emissions is to be conducted within three to six months of startup, and every three years “of operation.” However, testing isn’t *actually* required, because DOER states, “**A manufacturer guarantee and/or evidence of testing for**

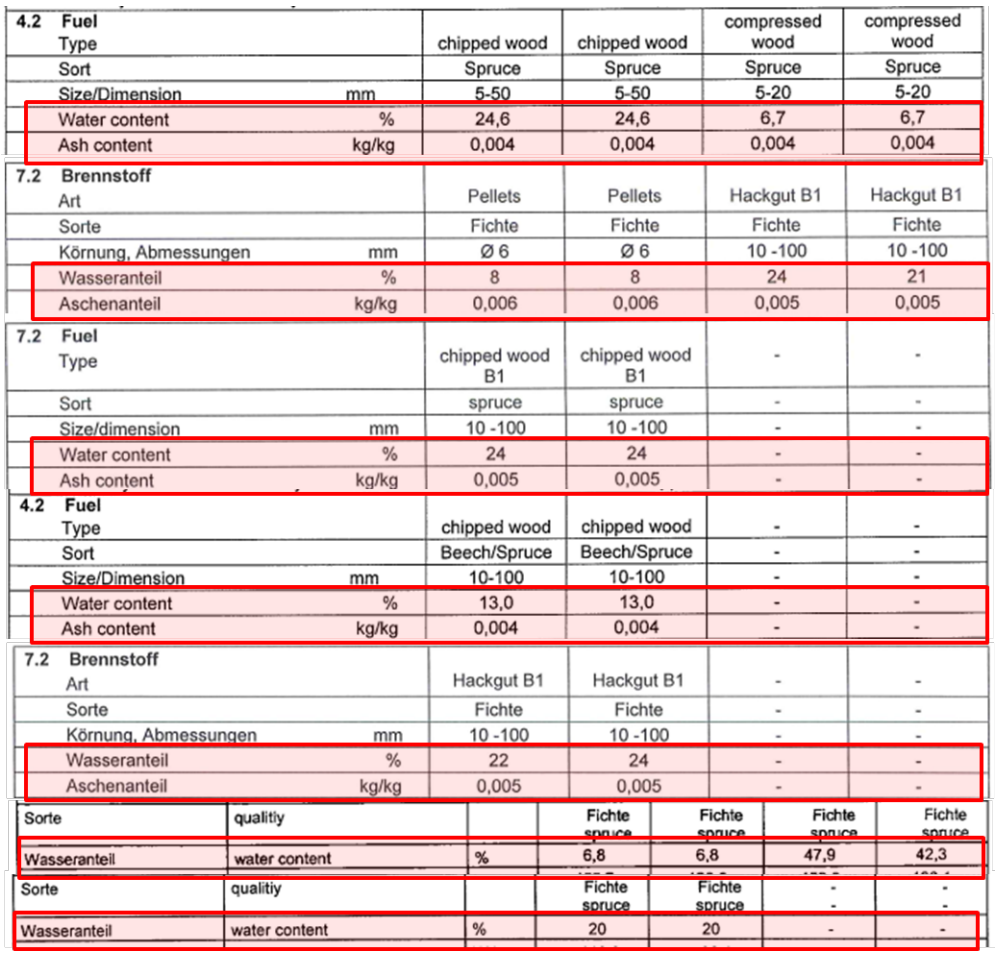
[38] *Guideline on Biomass, Biogas, and Biofuels for Eligible Thermal Generation Units*, pp. 10-11.

similar units of the same model are sufficient."[39] Further, the *Guideline* suggests DOER will accept written statements in lieu of testing for emissions controls, stating "*If a wood chip fired boiler or furnace will be equipped with an emission control device (e.g., electrostatic precipitator), the owner or operator of the biomass heating system shall submit to the Department a statement from the biomass heating system installer that the system has been designed to meet the applicable emission limits.*"[40]

Should DOER accept European test results as sufficient evidence that a unit meets the APS emissions criteria, day to day emissions of APS-eligible units are likely to exceed tested results. This is because Europe uses different wood chip grades and commonly burns wood that is much drier than 35 percent moisture content as required by the draft regulation. The European standard grades chips into classes A1, A2, B1, and B2.[41] We reviewed the data for several of the units that are now eligible for incentives under various New England energy programs, and excerpted some of these results in Figure 7. These units were tested with the EN 303-5 protocol and had to state the moisture content of the fuel chips burned. The tests were conducted using chips over a large range of moisture contents - for instance, one test used a chip with 13% moisture content, a fuel that is not available in the US. Some of the units tested with chips that had a moisture content range from 20-24%, considerably drier than 35 percent moisture content specified by DOER. Results from these tests are not representative of the performance of these units when burning fuels with a higher moisture content, as allowed by DOER in the draft regulations.

Also, note that where shown, the ash content of these chips was consistently 0.5 percent and below. This is considerably lower than the 1.5 percent ash content that DOER is allowing for the chip standard. Boiler emission and efficiency results are closely tied to the chip quality. The units are designed to be used with a specific chip size and moisture content.

[39] *Guideline on Biomass, Biogas, and Biofuels for Eligible Thermal Generation Units*, pp. 8-9.
[40] Ibid.
[41] Alakangas, E. European standard (EN 14961) for wood chips and hog fuel, Forest Bioenergy 2010, 31st August – 3rd September 2010, Book of proceedings. FINBIO Publications 47, p. 329 – 340. At https://www.researchgate.net/publication/268403209_EUROPEAN_STANDARD_EN_14961_FOR_WOOD_CHIPS_AND_HOG_FUEL



4.2	Fuel Type		chipped wood	chipped wood	compressed wood	compressed wood
	Sort		Spruce	Spruce	Spruce	Spruce
	Size/Dimension	mm	5-50	5-50	5-20	5-20
	Water content	%	24,6	24,6	6,7	6,7
	Ash content	kg/kg	0,004	0,004	0,004	0,004
7.2	Brennstoff Art		Pellets	Pellets	Hackgut B1	Hackgut B1
	Sorte		Fichte	Fichte	Fichte	Fichte
	Körnung, Abmessungen	mm	Ø 6	Ø 6	10 -100	10 -100
	Wasseranteil	%	8	8	24	21
	Aschenanteil	kg/kg	0,006	0,006	0,005	0,005
7.2	Fuel Type		chipped wood B1	chipped wood B1	-	-
	Sort		spruce	spruce	-	-
	Size/dimension	mm	10 -100	10 -100	-	-
	Water content	%	24	24	-	-
	Ash content	kg/kg	0,005	0,005	-	-
4.2	Fuel Type		chipped wood	chipped wood	-	-
	Sort		Beech/Spruce	Beech/Spruce	-	-
	Size/Dimension	mm	10-100	10-100	-	-
	Water content	%	13,0	13,0	-	-
	Ash content	kg/kg	0,004	0,004	-	-
7.2	Brennstoff Art		Hackgut B1	Hackgut B1	-	-
	Sorte		Fichte	Fichte	-	-
	Körnung, Abmessungen	mm	10 -100	10 -100	-	-
	Wasseranteil	%	22	24	-	-
	Aschenanteil	kg/kg	0,005	0,005	-	-
Sorte	qualitiy		Fichte spruce	Fichte spruce	Fichte spruce	Fichte spruce
Wasseranteil	water content	%	6,8	6,8	47,9	42,3
Sorte	qualitiy		Fichte spruce	Fichte spruce	-	-
Wasseranteil	water content	%	20	20	-	-

Figure 7. Water content and ash content of fuels used in tests on seven European boilers tested under the EN 303-5 protocol.

If DOER accepts European tests that were conducted at a low moisture content, then allows the unit to burn a wetter fuel at 35 percent moisture content (to say nothing of the moisture content of the chips that will *actually* be burned in practice, which will likely be much higher than 35 percent), the APS units are likely to routinely exceed tested emissions levels. The regulation should require the unit to be tested using the same fuel quality and moisture content as will actually be burned during use.

A statement of a design cannot be a substitute for emissions testing. The practical outcome is that these emissions cannot be monitored, and inevitably, significantly more PM will be emitted than is promised in the proposed *Guideline on Biomass*. Likewise, for units over 3 MMBtu/hr emissions testing every three years is inadequate (*Guideline*, section 8-C), and does nothing to ensure compliance with emissions standards in real time.

Further, DOER is allowing use of an emissions test – EN 303-5 – that is recognized as flawed by EPA and others. The EN 303-5 method that DOER endorses is conducted at high load and steady state, and is a hot filter method that **does not assess the condensable organic**

emissions which comprise significant amounts of respirable PM.[42] In other words, the test results miss a large percentage, perhaps even the majority, of the health-impacting particulate matter emitted by these units. EPA's New Source Performance Standards (NSPS) **require emissions testing for biomass boilers at below 15% of full load**, because units operate more than 40 percent of their time at this load where efficiency is lower and emissions are higher. However, the EN 303-5 test, as allowed by DOER, **only tests down to 30 percent load**. Failing to test at loads below 30 percent, as EPA requires, will mask poor performance. Boilers will be operated day-to-day at lower loads than tested, meaning they will be emitting more pollution than they claim. Coupling this with DOER's acceptance of a manufacturer's guarantee in lieu of actual testing practically guarantees these units will be needlessly polluting, endangering peoples' health. Figure 8 is taken from a presentation on thermal storage[43] and illustrates the greater pollution that is emitted when boilers are operated at low loads.

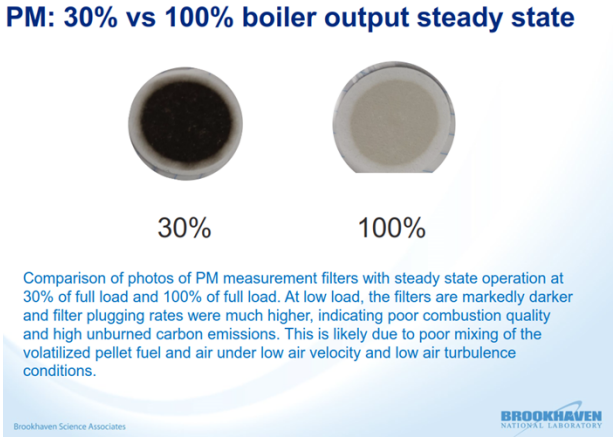


Figure 8. Particulate matter emissions increase when boilers are operated at low loads.

If DOER allows wood boilers to test using the EN 303-5 method, then boilers should be required to operate day-to-day in the mode in which they were tested, to have any chance of actual performance matching tested performance. The regulation should limit the amount of cycling the boiler can perform, since starting and stopping of the combustion process causes high emissions that are not captured in the EN 303-5 test, which is a high-load, steady-state test.

Biomass units approved by DOER will not be legal under EPA standards

Despite the APS statute requiring DOER to "*limit eligibility only to best-in-class commercially-feasible technologies*," the department is providing subsidies for units that *won't even be legal in*

[42] While the NSPS Step 1 allows testing by the EN 303-5 test method for certain boilers such as cord wood boilers, the certification test laboratory is required to use the EPA sampling train for capturing particles to ensure all of the particulate is captured and measured, including the condensable fraction.

[43] Butcher, T. et al. Impact of Thermal Storage on Pellet Boiler Performance. Presentation given at NESCAUM, November 30, 2016. At http://www.nescaum.org/documents/understanding-and-reducing-residential-wood-combustion-emissions

two years. In 2020, EPA's NSPS Step 2 will be implemented and will no longer accept any units based on EN 303-5 test data. Accordingly, DOER should set requirements equal to the Step 2 NSPS *now*.

EPA provides the following background on the NSPS:

"The Clean Air Act (CAA) requires the EPA to set NSPS for industrial categories that cause, or significantly contribute to, air pollution that may endanger public health or welfare. Residential wood smoke emissions are a significant national air pollution problem and human health issue. These emissions occur in many neighborhoods across the country and impact people in their homes. Wood smoke is made up of a mixture of gases and fine particles that are produced when wood and other organic matter burns. The fine particles in smoke – also called fine particulate matter (PM) pollution or PM2.5 (because these particles have a diameter ≤ 2.5 micrometers) – can get deep into the lungs, harming the lungs, blood vessels and heart. People with heart, vascular or lung disease, older adults and children are the most at risk. On an economic basis, the public benefits of this rule vastly outweigh the costs, with every dollar in additional cost producing more than $100 in public benefit."[44]

As written, DOER's regulations leave a gap of unregulated wood boilers between residential size (which are covered by the NSPS) and 3 MMBtu/hr, the size at which DEP regulations cover commercial boilers in Massachusetts. The regulations should eliminate this gap by requiring that *all* boilers less than 3 MMBtu/hr in size meet EPA's NSPS. Vermont and New Hampshire enacted regulations that clearly articulate that units smaller than 2.5 MMBTU/hr are subject to the requirements of the residential wood heater NSPS, regardless of their installation location. Why would Massachusetts adopt standards that are more lax than those of neighboring states?

These problems have previously been brought to the attention of DOER, yet the revised draft regulations indicate that DOER has ignored much of the input received to this point. We cannot presume to know why DOER has chosen to advance regulations that favor the biomass industry at the expense of protecting public health, nor why the Department of Environmental Protection (DEP), which DOER is required by law to consult with in developing the APS performance standards, has agreed to such lax standards. We expect more from the agencies that are charged with protecting health, and we expect more from the State of Massachusetts, which has a proud heritage of driving innovation in clean energy. These proposed rules fail to meet the public and statutory mandate to promote clean energy, and must be rejected in their current form.

Thermal storage requirements do not meet EPA's NSPS standard

DOER's thermal storage requirements also do not conform to EPA's NSPS. The regulations should incorporate the NSPS requirements of at least 119 gallons for units less than or equal to 25 kW

[44] U.S. Environmental Protection Agency. Small Entity Compliance Guide for 'Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces.' EPA 456/B-15-002, May 2015. Accessed August 3, 2017 at https://www.epa.gov/sites/production/files/2015-05/documents/2015-small-entity-compliance-guide.pdf

and 2 gal/1000 Btu for all units larger than 25kW unless tested by M28 WHH or M28 WHH-PTS in all categories including Cat I (<15% of full load output). To do otherwise will create loopholes and confusion between the Massachusetts program and federal law.

The APS legislation calls for use of thermal storage "if feasible."[45] However, the regulations provide a major loophole that allows installed boilers to avoid using thermal storage. Thermal storage is important for minimizing boiler cycling, which is associated with increased pollution emissions. Review of comments in the docket indicate that some in the biomass industry are opposed to the thermal storage requirements, for instance Viessman, which complained about thermal storage requirements to DOER in its comment letter of June 30, 2016. Figure 9 is taken from a presentation on thermal storage,[46] and demonstrates the clear effect thermal storage has on reducing boiler cycling (as manifested in stack temperature).

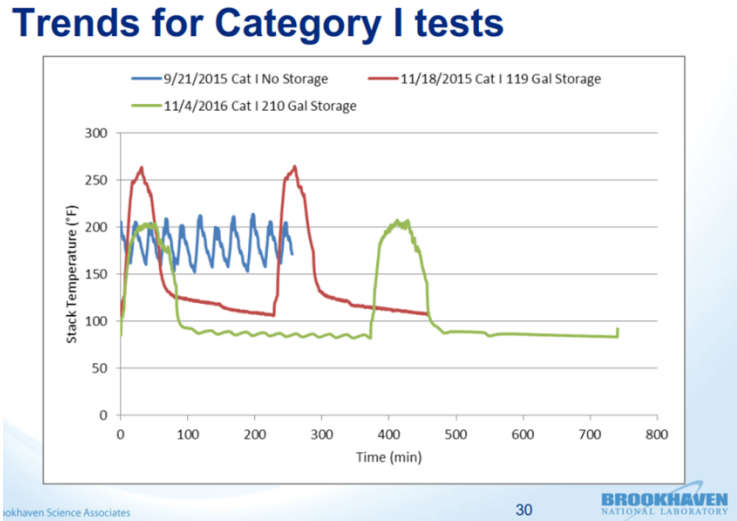


Figure 9. Effect of thermal storage on boiler cycling.

The regulations should be revised to remove the thermal storage loophole. The legislation is poorly constructed, because it does not specify what circumstances might render thermal storage not "feasible." This is likely to be interpreted in financial terms, but given the clear air quality and health benefits of minimizing cycling, the cost of a unit should simply be assumed to include thermal storage.

[45] MGL Ch. 25A § 11F1/2(b)(iii).

[46] Butcher, T. et al. Impact of Thermal Storage on Pellet Boiler Performance. Presentation given at NESCAUM, November 30, 2016. At http://www.nescaum.org/documents/understanding-and-reducing-residential-wood-combustion-emissions

There is no way to monitor fuels that are actually burned

The *Guideline on Biomass* requirements for monitoring use of "eligible biomass fuel" (Section 4-Verification) will not ensure use of clean, approved fuels.[47] Operators are required to keep records of fuel deliveries, and certify that emission controls were operated in accordance with the manufacturer's specifications. These requirements are meaningless. Would someone who is burning contaminated fuels in a unit keep records of that fact? Further, how does attesting to operation of emissions controls reflect anything about whether the unit was operated correctly? There is no monitoring – so an operator might not even know if a unit were malfunctioning.

Fuels may be contaminated with heavy metals and air toxics

Wood derived fuels contain a plethora of pollutants and contaminants. In our earlier comments we referred to data from NESCAUM on contaminants found in samples of wood pellets. Those concerns were echoed by Massachusetts DOER under the former administration. There is still nothing in the guidelines or regulations constraining the amount of heavy metals that can be found in "eligible" biomass fuels.

Cordwood boilers should not receive subsidies

We object that cordwood boilers have been added as an eligible technology. Given the requirement for automatic feeding systems, cordwood is an inappropriate fuel. Further, given that cordwood is sourced mostly from whole tree harvesting, there is no way that cordwood boilers are going to meet the greenhouse gas criteria that require a 50% reduction in GHG emissions below an efficient gas boiler. Cordwood boilers also have high potential for dangerously polluting conditions unless the installation has been carefully engineered and unit operation and fuel use practices (such as piece size and wood moisture requirements) are meticulously followed. Studies conducted have shown that emissions can vary by orders of magnitude from certification levels to actual in use practices.As stated above, DOER itself recognizes the problem, stating "*It is* ***imperative that the wood fuel be at moisture content of 20% or below*** *so that good combustion of the fuel is achieved. When wood above 20% moisture content or greenwood is used in advanced cord wood boilers seasonal efficiency decreases significantly while* ***smoke emissions drastically increases***."[48]

Thermal Waste-to-Energy

The revised draft regulations now allow heat generated from municipal solid waste (MSW) waste-to-energy (WTE) incinerators to qualify for the APS, pursuant to amendments to the law made in 2016. The regulations define an eligible Thermal WTE Generation Unit as one that utilizes conventional municipal solid waste plant technology in commercial use to generate Useful Thermal Energy and was in operation as of January 1, 2016. (225 CMR 16.02) There are seven MSW

[47] MA DOER proposed "***Guideline on Biomass, Biogas, and Biofuels for Eligible Thermal Generation Units"***

[48] Ibid, pp. 10-11.

incinerators operating in Massachusetts, of which only one, Covanta Pittsfield, currently sells steam for heat.

Our groups have serious concerns about the inclusion of WTE in the APS, many of which overlap with concerns previously raised regarding greenhouse gas emissions and air pollution from burning biomass. In fact, 64% of MSW by weight is composed of biomass.[49] The remainder includes plastics and other waste which, when incinerated, not only release fossil-derived GHGs but also a wide range of air toxics including mercury and other heavy metals, dioxins, furans, and VOCs. Recent studies in both New York and Maryland documented that emissions from state-of-the-art MSW incinerators are higher than coal-fired power plants for both greenhouse gas emissions[50]and criteria and hazardous air pollutants, [51] on a per megawatt-hour (MWh) basis.

Despite the fact that roughly half of the energy generated by MSW incinerators is derived from biomass, the regulations do not apply the same standards to WTE as they do to biomass, such as requiring a 50 percent reduction in life-cycle greenhouse gas emissions compared to a high efficiency unit utilizing the fuel that is being displaced. Instead, the subsidies will go to support ongoing practices, not displacement of dirtier fuels (arguably, there are no dirtier fuels than MSW that could be displaced).

The potential subsidies for WTE could be significant. For Covanta Pittsfield alone, which has a 240 ton per day capacity, the costs could run to millions of dollars per year, if the unit is utilizing a majority of the steam it produces as useful thermal energy and this is eligible for subsidies. Should any of the other WTE incinerators operating in MA become eligible for the APS, the costs could be astronomical. At a minimum, the draft regulations should be tightened to clarify that only WTE incinerators that produced and sold useful thermal energy as of January 1, 2016 would be eligible for the APS.

Existing Law and the Enabling Statute: Failures to Comply

The revised draft regulations do not comply with the enabling statute and other Massachusetts laws, including inconsistencies and conflicts with existing standards present in other Massachusetts regulations and programs. If adopted, these regulations would significantly undermine other Massachusetts policies, laws, and programs aimed at reducing greenhouse gas emissions, protecting public health, and promoting sustainable management of forest ecosystems. In addition, DOER has failed to consider the reasonably foreseeable climate change impacts, including additional greenhouse gas emissions, that would result from adoption of these regulations.

[49] https://www.eia.gov/energyexplained/?page=biomass_waste_to_energy

[50] NYSDEC, "*Beyond Waste,"* see note 3*, supra*.

[51] Steven C. Russo, Esq., et al., see note 4, *supra*; Environmental Integrity Project *, Waste-To-Energy: Dirtying Maryland's Air by Seeking a Quick Fix on Renewable Energy?,* October 2011.

The proposed regulations do not meet the substantive requirements of the enabling statute

MGL Ch. 25A § 11F1/2(b) includes specific language regarding performance criteria for biomass that must be met for it to qualify as an alternative energy-generating source. It is clear that the Legislature intended to closely control the conditions under which biomass generation may qualify as renewable energy. The proposed implementing regulations and guidelines do not meet this mandate.

In recognition of the health impacts of air pollution from biomass burners, the statute contains detailed restrictions on biomass's eligibility for the APS, and narrowly defines the conditions under which carbon pollution from burning biomass may sometimes be considered to be offset to mitigate climate change effects. Specifically, the statute requires DOER, in consultation with DEP, to set the following minimum requirements for eligible biomass, biogas and liquid biofuel technologies:

(i) Emission performance standards that are protective of public health, including standards that limit eligibility only to best-in-class commercially-feasible technologies with regard to reducing emissions of fine particulate matter, carbon monoxide and other air pollutants;
(ii) 50% reduction in life-cycle greenhouse gas emissions;
(iii) Thermal storage or other means to minimize deterioration of efficiency or emissions;
(iv) Fuel conversion efficiency performance standards; and,
(v) For forest-derived biomass, requirements that fuel shall be provided by means of sustainable forestry practices, provided that any adoption of such standards shall take place after a public comment process.

As discussed in these comments, and in previously submitted joint comments,[52] both the initial and revised draft 225 CMR 16.00 regulations and associated guidelines are substantially less protective than the 2012 biomass regulations implementing the Massachusetts RPS (MGL Ch. 25A § 11).[53] Yet the letter and the spirit of the APS statute clearly indicate the Legislature's intent to narrowly limit eligibility regarding which biomass fuels and technologies may qualify for these subsidies, consistent with the existing RPS law.

Our comments cite numerous examples documenting how both the initial and revised draft regulations fail to meet the requirements of the enabling statute. These include, but are not limited to, the following:

- The proposed regulations and guidelines lack enforceable standards to ensure that fuel suppliers and generation units use only eligible forest-derived biomass provided by means of sustainable forestry management practices. The definition for sustainable forestry management is vague and unenforceable; important requirements that ensure

[52] *See* note 1.

[53] 225 CMR 14.00.

retention of residues and protections of forest soils have been removed; there is little to no ongoing oversight of biomass sourcing; and there appears to be no ongoing enforcement mechanism to ensure that biomass suppliers comply with the limited requirements that the regulations do contain.

- The proposed regulations and guidelines lack an accurate or enforceable means of determining whether the biomass fuel or technology used will result in a 50% reduction in life-cycle greenhouse gas emissions. DOER added an Excel workbook, the *Guideline on Reduction of Greenhouse Gases,* when it issued the revised draft regulations. However, this workbook fails to account for differing lifecycle emissions of various biomass fuels (unlike the 2012 biomass regulations, which do). Processed fuels, such as wood pellets and chips, require a large energy input to manufacture, resulting in greater lifecycle CO_2 emissions, and many use whole trees as feedstock. The proposed draft regulations also increase the timeframe for assessment of net carbon emissions from bioenergy by 50 percent, from 20 years to 30 years, compared to the 2012 biomass regulations. This will result in greater carbon loading to the atmosphere.

- In the absence of verifiable data, DOER assumes that all generation units that purchase fuel from a fuel supplier on the Department's Biomass Suppliers list have met the requirement for a 50% reduction in lifecycle GHG emissions and are not required to provide any further analysis. DOER has not shown how it will verify essential information required to determine these emissions, such as sources of wood for pellet manufacture or the soil type where the wood was harvested.[54]

- The draft regulations propose standards for particulate matter emissions that are generally more than twice as high as emissions standards set under another Massachusetts thermal incentive program, the SAPHIRE program, which themselves are not "best in class." Further, the regulations endorse use of an emissions test protocol that does not conform with EPA's New Source Performance Standards (NSPS). Use of this protocol for testing will likely render units as eligible for Alternative Energy Credits that cannot meet emissions standards during every-day operation.

- While the APS statute requires DOER to "*limit eligibility only to best-in-class commercially-feasible technologies*," the proposed standards would allow units to be eligible for APS credits that will fail to meet the EPA's NSPS standards for biomass boilers that will go into effect in 2020.

Until and unless the outstanding substantive issues we have raised are addressed, "Eligible Biomass Woody Fuel" and "Manufactured Biomass Fuel" must be removed from the proposed regulation's definition of "Eligible Biomass Fuel."

[54] DOER Draft *Guideline on Biomass, Biogas, and Biofuels for Eligible Renewable Thermal Generation Units.*

The proposed regulations do not meet the process requirements of the enabling statute

MGL Ch. 25A § 11F1/2(b) (v) states that the department "shall adopt any existing or new biomass fuel sustainability standards if deemed appropriate by the department **after a public comment process**." Rather than adopt existing sustainable forestry practices that have been developed with broad stakeholder input for other Massachusetts programs, DOER proposes considerably weaker standards as part of the *Guideline on Biomass*. This guideline has not been subject to a public comment process, as required by the APS statute. Moreover, it significantly undermines Massachusetts policies that were previously in place, including the 2012 biomass regulations and the *2013 Massachusetts Forestry Best Management Practices Manual* published by DCR, both of which were developed with input from the public and from forestry experts.

Until such time as DOER, in consultation with DCR, has fully defined and codified the standards for "sustainable forestry practices" and has held the required public involvement process, "Eligible Biomass Woody Fuel" and "Manufactured Biomass Fuel" must be removed from the proposed regulation's definition of "Eligible Biomass Fuel." Furthermore, the Department should assess the potential greenhouse gas impacts resulting from weakening forest protections and greenhouse gas accounting protocols as proposed in DOER's *Guideline on Biomass.*

The proposed regulations allow for illegal exceptions to the statutory requirements

The guidelines referenced in the regulations give the DOER unfettered power to make exceptions, undermining the entire rulemaking process. All of the narrative guidelines associated with the draft regulations conclude with the following section: **"**Miscellaneous: The Department may permit an exception from any provision of this Guideline for good cause."

As we noted in our previous joint comments, the statute sets minimum requirements for eligible biomass from which DOER and generators may not deviate. DOER is not authorized to make unlimited exceptions. For instance, DOER may not allow a biomass generator to deviate from the statute's low emissions, high efficiency and sustainability mandates. Even exceptions that do not violate the requirements of the statute must be made in consultation with the DEP, per the statute. This should be clearly stated in the Guidelines and/or regulations, together with the process by which requests for exceptions may be considered and an opportunity for public comment and review.

Similarly, the statute makes no provision for DOER's proposed co-firing waiver, which has been amended in the most recent revisions to allow a portion of the Useful Thermal Energy (in addition to electrical energy) from a Generation Unit that uses an APS Ineligible Energy Source with another fuel to potentially qualify for APS credits.[55] DOER should remove the co-firing waiver from the regulations, rather than expanding it. A fossil-fired plant would not meet the qualifications for facilities using biomass fuel, even if it were co-firing 80 percent biomass,

[55] 225 CMR 16.05(2).

because it would not be burning fuel that was "low emission" and "produced by sustainable forestry practices."

The proposed regulations conflict with GHG reduction requirements set forth in the GWSA

Last year's SJC ruling requires that the state adopt regulations, pursuant to the Global Warming Solutions Act, that establish limits on multiple greenhouse gas emissions sources *and that such limits must decline on an annual basis*. *Kain v. Dept. of Envt'l Prot.*, SJC-11961, Slip op. (May 17, 2016). The proposed APS regulations could result in significant new sources of and increases in carbon dioxide emissions prior to the state having adopted the required regulations. In fact, unlike geothermal or solar thermal, where the emissions will decrease linearly as more people take advantage of the subsidy, with biomass, emissions will increase with increased adoption of the technology, because bioenergy net emissions are greatest at the beginning of a facility's lifecycle. Further, the more successful the program, the greater the need for fuel, and the more likely it is that sources of biomass with reduced lifecycle emissions will be exhausted and trees will increasingly be harvested for fuel. Thus, by definition, if this program is successful – if it promotes biomass and more and more units are adopted each year – the cumulative GHG load will increase over time.

DOER must analyze environmental impacts of proposed regulations prior to adoption

The Massachusetts Environmental Policy Act (MEPA) requires that state agencies study the environmental consequences of their actions, including permitting and financial assistance. It also requires them to take all feasible measures to avoid, minimize, and mitigate damage to the environment. MEPA further requires that agencies consider "reasonably foreseeable climate change impacts, including additional greenhouse gas emissions, and effects, such as predicted sea level rise" prior to administrative decisions and approvals.

These regulations incentivize the burning of biomass, which contributes greater greenhouse gas emissions than fossil fuels per unit of energy, within a program intended to promote alternative energy supplies that are cleaner than coal, oil, or natural gas. DOER has failed to conduct an environmental review of the potential greenhouse gas emissions resulting from these proposed regulations.

Additionally, MEPA review is required when new or revised regulations are promulgated, of which a primary purpose is protecting against Damage to the Environment, if those regulations significantly reduce standards for environmental protection; opportunities for public participation in permitting or other review processes; or public access to information generated or provided in accordance with the regulations. The new sustainable forestry standards proposed in the *Guideline On Biomass, Biogas, And Biofuels For Eligible Renewable Thermal Generation Unit* are significantly weaker than other standards that currently govern biomass harvesting and will likely result in a significant adverse environmental impact on forest

protection on a regionwide basis and an increase in greenhouse gas emissions that has not been assessed by the Department.

DOER must conduct an environmental justice review

As noted in our comments throughout, the proposed regulations have significant air quality and public health impacts, including the weakening of existing standards. These impacts can have a disproportionate impact on the region's low-income residents, communities of color, immigrants, and other vulnerable populations. This, combined with the addition of new incentives that will benefit a specific WTE facility located in an environmental justice community, requires DOER to provide for meaningful participation and conduct an adequate Environmental Justice review pursuant to Executive Order 552 and EOEA's Environmental Justice policy, before adopting these proposed regulations.

Conclusion

Thank you for this opportunity to review and provide comments on the revised draft CMR 225 16.00 regulations. As noted above the regulations continue to have several deficiencies. We urge DOER to remove Eligible Biomass Woody Fuel, Manufactured Biomass Fuel, and Thermal Waste to Energy from the program until such time as DOER corrects the flaws evident in the draft regulations. Any new program must comply with existing law, protect environmental justice communities, and meet if not surpass the Commonwealth's goals under the Global Warming Solutions Act.

Thank you for your consideration,

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