Joint Environmental Comments on Proposed Changes to the Biomass Regulations in the Renewable Energy Portfolio Standard (225 C.M.R. 14.00 and 225 C.M.R. 15.00)

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Clean Water Action
Climate Action Now—Western Mass
Concerned Citizens of Franklin County
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Environment Massachusetts
Environmental League of Massachusetts
Friends of the Earth
Green Berkshires, Inc.
Green Energy Consumers Alliance
Health Care Without Harm
Massachusetts Climate Action Network
Massachusetts Sierra Club
Natural Resources Council of Maine
Natural Resources Defense Council
No Fracked Gas in Mass
Pipe Line Awareness Network for the Northeast
The Rachel Carson Council
RENEW Northeast
SAFE-Salem Alliance for the Environment
Southcoast Energy Challenge
Southern Environmental Law Center
Springfield Climate Justice Coalition
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I. Introduction

The Massachusetts Department of Energy Resources ("DOER") is proposing to substantially roll back hard-won 2012 environmental and health protections governing woody biomass in the state's Renewable Portfolio Standard ("RPS") regulations, 225 C.M.R. 14.00.[1] This letter, prepared by Conservation Law Foundation, the Partnership for Policy Integrity, and RESTORE, and signed by 31 additional groups with members throughout the Commonwealth and communities in other states that may be impacted by the proposed changes, details our opposition to the proposed changes. Our groups' positions on other changes proposed to 225 C.M.R. 14.00 and 225 C.M.R. 15.00, including changes to the hydropower, municipal waste combustion, and market requirements, are represented in separate comment letters on those specific topics being filed today. Our groups did not fight for more than four years to achieve legislation in 2018 to increase the RPS[2] only to see the standards for qualification under the RPS weakened.

It is especially concerning that DOER is proposing to "streamline" the RPS biomass standards in part by importing provisions from the Alternative Portfolio Standard ("APS") regulations for thermal biomass facilities, 225 C.M.R. 16.00.[3] This approach is fundamentally flawed since thermal biomass facilities are categorically more efficient than electric-only biomass generators.[4] Furthermore, many of the undersigned groups have pointed out serious flaws in the current APS thermal biomass regulations and carbon accounting guidance, virtually none of which have been addressed by DOER.[5]

Climate scientists say we need to cut emissions in half in the next ten years

Climate science shows that to avoid catastrophic warming, we must reduce emissions and take CO_2 that's already been emitted *out* of the atmosphere—most likely by restoring and expanding forests to increase carbon sequestration. Specific targets include cutting emissions in half in the next ten years and achieving emissions neutrality—where GHG emissions are balanced by uptake—by 2050. Inefficient biomass electric generation will only detract from, rather than contribute to, that scenario. In fact, the first pathway for climate mitigation in the recent

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[1] Citations to the proposed changes are noted throughout as "Proposed 225 C.M.R. 14.XX." The undersigned have also reviewed the proposed changes to 225 C.M.R. 15.00, et seq., and believe them to substantively mirror the changes discussed here. All discussion of provisions in the proposed version of 225 C.M.R. 14.00 *et seq.* should be deemed to apply to the proposed changes to 225 C.M.R. 15.00 *et seq.* as well.

[2] An Act to Advance Clean Energy, Ch. 227 of the Acts of 2018, § 12.

[3] Press Release, Massachusetts Dep't of Energy Resources, RPS and APS Stakeholder Announcement 2 (Apr. 11, 2019), https://www.mass.gov/files/documents/2019/05/15/RPS%20and%20APS%20Stakeholder%20Announcement.pdf.

[4] *See, e.g.*, THOMAS WALKER ET AL., MANOMET CTR. FOR CONSERVATION SCIS., BIOMASS SUSTAINABILITY AND CARBON POLICY STUDY 25 tbl. 2-6, 26 tbl. 2-7 (2010) [hereinafter MANOMET STUDY], https://www.mass.gov/files/documents/2016/08/qx/manomet-biomass-report-full-hirez.pdf.

[5] *See* Conservation Law Found., Comments on Revised Proposed Changes to Alternative Portfolio Standard Regulations (225 C.M.R. 16.00) (Aug. 7, 2017); P'ship for Policy Integrity et al., Joint Comments on Revised Proposed Changes to Alternative Portfolio Standard Regulations (225 C.M.R. 16.00) (Aug. 7, 2017), https://www.pfpi.net/wp-content/uploads/2017/11/DOER_APS_JointBioenergyComments_8-7-2017.pdf.

Intergovernmental Panel on Climate Change (IPCC) report[6] shows a global *reduction* in bioenergy compared to 2010 levels.[7]

The Commonwealth cannot afford policy decisions that will increase carbon emissions

Massachusetts has been a leader in working to reduce greenhouse gas emissions and increase renewable energy generation. However, since Massachusetts enacted the landmark Global Warming Solutions Act (GWSA) in 2008,[8] overwhelming scientific consensus tells us that we must do more. The GWSA's 80% emissions reduction goal falls short of what the latest IPCC report says is required by 2050—economy-wide carbon neutrality, where emissions are balanced by uptake.[9] Multiple pieces of legislation that would increase the stringency of our ultimate carbon reduction goal based on that science are before the General Court this session.

In order to meet the current or a strengthened version of our GWSA requirements, every policy and regulatory decision made by a department under the Executive Office of Energy and Environmental Affairs ("EEA") needs to be aimed at achieving long-term greenhouse gas emission reductions. At the very least, DOER should hold any changes to the RPS that could result in additional combustion of biomass until the Clean Energy and Climate Plan for 2030 is completed. Development of any revisions to the RPS so resulting from the Clean Energy and Climate Plan for 2030 should only be undertaken following a stakeholder process that includes environmental advocates.

Biomass power plants emit more CO_2 pollution than coal or gas plants; the impact lasts decades

The Commonwealth set a necessary and appropriate standard for science-based regulation of bioenergy by commissioning the Manomet Study in 2009, which found that while wood is technically renewable, wood-burning power plants are net sources of CO_2 over climate-mitigation relevant timeframes unless certain extremely restrictive criteria are met. Per megawatt-hour (MWh) of electricity generated, smokestack CO_2 emissions of a wood-burning power plant are about 150% those of a new coal plant, and about 350% those of a new combined cycle natural gas plant.[10] The study concluded that for a wood-burning plant burning a mixture of trees and forestry residues, it would require more than 40 years of forest regrowth to "offset" these emissions to the point where cumulative net emissions were even equivalent to those from a same-size coal plant, and it would require more than 90 years to draw emissions down to be equivalent with a same-size gas plant.[11] As these scenarios assume that

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[6] INTERGOV'TAL PANEL ON CLIMATE CHANGE, SPECIAL REPORT: GLOBAL WARMING OF 1.5°C. SUMMARY FOR POLICYMAKERS (2018), https://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf.

[7] *Id.* at 16; *see also* P'ship for Policy Integrity, *The IPCC's Recipe for a Livable Planet: Grow Trees, Don't Burn Them* (Oct. 7, 2018) (providing synopsis of IPCC's summary for policymakers), http://www.pfpi.net/the-ipccs-recipe-for-a-livable-planet-grow-trees-dont-burn-them.

[8] An Act Relative to Global Warming Solutions, St. 2008, c. 298.

[9] INTERGOV'TAL PANEL ON CLIMATE CHANGE, *supra* note 6, at 14, 26.

[10] MARY S. BOOTH, P'SHIP FOR POLICY INTEGRITY, TREES, TRASH, AND TOXICS: HOW BIOMASS ENERGY HAS BECOME THE NEW COAL (2014), http://www.pfpi.net/wp-content/uploads/2014/04/PFPI-Biomass-is-the-New-Coal-April-2-2014.pdf.

[11] MANOMET STUDY, *supra* note 4.

forests regrow perfectly and are not harvested at all as they are re-growing,[12] these timeframes are optimistic.

The Manomet Study was commissioned by the Patrick Administration in November 2009 in response to proposals for three electricity-only wood-burning power plants in Russell, Greenfield, and Springfield. Scientists and citizens, including many of the undersigned groups, expressed strong concerns about the carbon impacts of energy sources incentivized under the Renewable Portfolio Standard ("RPS"). A grassroots campaign to take energy sources that emitted more than a minimal amount of CO_2 out of the RPS collected over 100,000 signatures and qualified for the ballot in 2010. In the meantime, the state had commissioned the Manomet Study to examine the net carbon impact of burning wood for energy, and announced its intention to use the results of the study to inform state policy. When the study was completed in June of 2010, the Patrick administration agreed to issue a set of carbon accounting rules for biomass eligibility in the RPS based on the Manomet framework that would restrict renewable energy subsidies to high-efficiency biomass facilities (requiring combined heat and power, CHP) that could show a carbon benefit relative to fossil fueled generators over 20 years.[13] The ballot measure was set aside in exchange for this science-based rulemaking process.[14]

Finalized in 2012, the Massachusetts biomass rules for the RPS became the first in the nation and the world to recognize that burning woody biomass for energy cannot be presumed to be carbon neutral. The whole process took about four years, and involved the multi-investigator Manomet team, many public meetings, and tens of thousands of hours of time by scientists, activists, and regular citizens who weighed in to ensure that the state's rules were based in science.[15]

DOER is now proposing to rewrite the regulations to allow exactly the kinds of highly polluting, inefficient electric-only power plants that the original biomass framework rejected as too carbon intensive.

DOER's proposal is likely to increase air pollution in environmental justice communities

The proposed regulatory changes directing subsidies to certain electric-only biomass generators may facilitate the construction of the proposed 35 MW Palmer Renewable Energy wood-burning biomass plant in Springfield, MA. This plant is of particular concern to the undersigned groups due to the existing levels of fine particulate matter in the surrounding area, an

[12] *Id.*
[13] *Id.* at 7 fig. 3.
[14] *See, e.g.*, Elizabeth McGowan, *All Biomass Is Not Created Equal, At Least in Massachusetts*, INSIDECLIMATE NEWS (July 12, 2010), https://insideclimatenews.org/news/20100712/all-biomass-not-created-equal-least-massachusetts.
[15] *See* Ben Carmichael, *New Massachusetts Biomass Regulations Draw Praise from Environmental Advocates*, CLF.ORG (Apr. 27, 2012), https://www.clf.org/newsroom/new-massachusetts-biomass-regulations-draw-praise-from-environmental-advocates.

environmental justice community that according the Asthma and Allergy Foundation of America, is the most challenging place in the country for a person with asthma to live.[16]

The regulatory changes will benefit the biomass industry at the expense of the Commonwealth

DOER's proposal to eliminate the boiler efficiency requirement for certain fuels and lessen the stringency of fuel sourcing standards have been specifically requested in letters to DOER by the developers of the Palmer facility and other biomass industry players. One letter written in 2010, after the science-based DOER biomass plant efficiency standards had been proposed, suggests that a threshold of 20% efficiency be set to receive one renewable energy credit ("REC") per MWh, and 50% efficiency to receive 1.5 RECs per MWh. [17] A 2015 letter to Judith Judson submitted as part of the Baker Administration's regulatory review process makes an even more direct request:

> "Specifically, we are requesting that 225 CMR 14.00 be amended to omit all references to energy efficiency requirements for biomass facilities. A red-lined version of the regulations with our suggested changes is attached here for your reference… The incorporation of energy efficiency standards in these regulations raises a number of concerns for us, namely that the standards are nearly impossible for electricity-only biomass facilities to meet… These energy efficiency standards for biomass are strictly regulatory in nature, not statutory."[18]

The letter also includes a misleading statement that minimizes the carbon impacts of the fuel that Palmer's developers claim the plant will use.[19]

The Biomass Power Association, an industry lobbying group, submitted a letter to Commissioner Judith Judson titled "Rescinding the RPS Biomass Fuel Efficiency Regulation." The letter also contained several misleading statements about the GHG impacts of bioenergy, including that feedstock standards eliminate the need for boiler efficiency standards.[20]

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[16] ASTHMA & ALLERGY FOUND. OF AM., ASTHMA CAPITALS 2019: THE MOST CHALLENGING PLACES TO LIVE WITH ASTHMA (2019), https://www.aafa.org/media/2426/aafa-2019-asthma-capitals-report.pdf. The Asthma Capitals study ranks cities based on three factors: (1) asthma prevalence, (2) asthma-related emergency visits, and (3) asthma-related mortality rates. *Id.* at 10. The city of Springfield ranked number 1 overall and ranked number 1 or 2 for asthma-related emergency department visits in both 2018 and 2019. *Id.* at 6, 12.

[17] Letter from Dr. Victor A. Gatto, Chief Operating Officer, Palmer Renewable Energy, to Comm'r Philip Giudice, Mass. Dep't of Energy Res. 2–3 (Oct. 19, 2010), http://www.pfpi.net/wp-content/uploads/2019/05/Gatto-Victor-Palmer-Renewable-Energy.pdf.

[18] Letter from David Callahan, President, Palmer Renewable Energy to DOER Commissioner Judith Judson (Oct. 30, 2015), available at http://www.pfpi.net/wp-content/uploads/2019/07/Palmer-Renewable-Energy-comments-to-MA-DOER-Oct-30-2015.pdf.

[19] *Compare* Callahan Letter ("The Manomet study focused narrowly on modeling carbon emissions with units using forest-harvested wood for fuel. The results of the study are simply not relevant for units that rely on forest harvested byproducts and waste wood, as do the vast majority of facilities in New England.") *and* MANOMET STUDY, *supra* note 4, at 55 (noting that non-forest residues' carbon profile "is generally similar to logging residues").

[20] *See* Letter from Robert E. Cleaves IV to DOER Commissioner Judith Judson (Oct. 30, 2015), *available at* http://www.pfpi.net/wp-content/uploads/2019/07/Biomass-Power-Assn-comments-to-MA-DOER-Oct-30-2015.pdf.

Electric-only biomass facilities in Maine and their political allies have also lobbied for DOER's proposed changes. Biomass power plants in Maine that had been receiving renewable energy subsidies from Massachusetts prior to the Manomet Study-based regulations taking effect lost RPS eligibility under the current regulations in 2016. The plants closed temporarily when the subsidies ended in 2016, along with the Maine plant owners' wood-burning electric plants in California.[21]

Maine's then-Governor personally lobbied Governor Baker to change the regulations to allow the electric-only plants, which were too inefficient to meet the science-based regulations, to receive Massachusetts subsidies again:

> Several weeks ago, Gov. Paul LePage made a personal plea to Baker, a fellow Republican, to change the rules and allow the Maine biomass generators to once again qualify for the Bay State's renewable energy portfolio.
>
> 'They met in person, in Washington, D.C.,' said Patrick Woodcock, who directs LePage's energy office. He noted that the new Massachusetts standards were enacted by former Massachusetts Gov. Deval Patrick, a Democrat, and he said LePage's arguments were well-received by Baker. [22]

Maine attempted to provide its own subsidies for the plants but soon declined to extend the bailout, with then-Governor LePage in 2018 calling the state's expenditures on the inefficient plants "corporate welfare at the worst".[23]

In its proposed rollback of the regulations, DOER has done what the power plant operators, developers, and industry representatives have requested, eliminating any efficiency requirement for plants burning "salvage" wood and non-forestry residues, which is the primary fuel source claimed by the Palmer project in Springfield.[24] DOER has not been lobbied by scientists or environmental policy experts to loosen the electric-only boiler efficiency standards.

The payoff for electricity-only biomass plants will be considerable if the efficiency standard is eliminated. MA renewable energy credits are projected to increase to around $20-25/MWh in the next few years,[25] meaning the 35 MW Palmer plant could collect around $5 million to $8 million per year (or more, depending on REC prices and actual plant capacity) from electric ratepayers, indefinitely. The two previously qualified Maine plants would be eligible for up to

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[21] Erin Vogele, Biomass Magazine. Covanta announces shutdown of Maine, California biomass plants. April 28, 2016. At http://biomassmagazine.com/articles/13195/covanta-announces-shutdown-of-maine-california-biomass-plants.

[22] Fred Bever, Bangor Daily News. LePage asks Massachusetts to consider rule change to aid biomass industry. April 5, 2016. https://bangordailynews.com/2016/04/05/politics/lepage-asks-massachusetts-to-consider-rule-change-to-aid-biomass-industry/.

[23] Scott Thistle, Portland Press Herald. LePage tells lawmakers he will oppose borrowing aimed at helping biomass industry. Jan. 10, 2018. https://www.pressherald.com/2018/01/10/lepage-tells-lawmakers-he-will-oppose-borrowing-bills-aimed-at-helping-biomass-industry/.

[24] *See Gatto letter* at 1 (asserting that the facility will produce power from "1200 tons per day of green wood chip material from tree-trimming activities").

[25] SYNAPSE ENERGY ECON., INC. & SUSTAINABLE ENERGY ADVANTAGE, LLC, AN ANALYSIS OF THE MASSACHUSETTS RENEWABLE PORTFOLIO STANDARD 29 fig. 13 (2017), http://www.synapse-energy.com/sites/default/files/Analysis-MA-RPS-17-004.pdf.

$10 million per year; other plants in Maine and other states (as well as Canada) might also try to qualify for subsidies.

The biomass regulations should be strengthened to reflect climate urgency, not weakened

Since 2012, when the MA biomass RPS rules were adopted, we have learned the climate crisis is even more urgent than previously thought. The IPCC says we need to cut emissions in half in the next ten years—an incredibly daunting task. Meanwhile, it has become clear that DOER's original bioenergy carbon accounting framework underestimates actual CO_2 emissions by building in a number of favorable assumptions, as discussed below. Taken together, these facts require that DOER strengthen the biomass regulations and make them more restrictive to ensure that bioenergy policy in Massachusetts will not undermine EEA's critical climate mitigation efforts.

The following comments address local and regional air pollution impacts, greenhouse gas emissions impacts, emissions from liquid biofuels, accountability provisions, and forestry protections. A limited handful of bioenergy-related changes are positive, but the overwhelming effect of the proposed regulatory changes will be to threaten the health of communities already susceptible to air pollution-related illnesses, increase greenhouse gas emissions, and negatively impact forest health.

II. The proposal will increase air pollution with local and regional health impacts from bioenergy

DOER's proposal will increase emissions of particulate matter, NOx, and a variety of air toxics from wood-burning in three ways:

A. By increasing overall the amount of wood, including "waste" wood, that is burned overall (as discussed in Section III.D, *infra*);

B. By incentivizing lower-efficiency plants to be built, thereby increasing emissions of all pollutants per unit energy, relative to higher-efficiency plants (discussed in Section III.A., *infra*);

C. By reducing protective measures from the 2012 regulations (discussed in this section).

Sets inadequately protective emission standards for air pollutants

Draft Guideline on Eligible Biomass Fuel for Renewable Generation Units: The NOx emissions standard for qualifying units greater than 10 MW is 0.065 lb/MMBtu, and for PM is 0.012 lb/MMBtu (though DOER does not state if this is for filterable PM only, or filterable + condensable). The guideline states, "Over time, the emissions limits of Table One will be lowered if it is determined that more stringent limits are commercially available and economically feasible." However, lower standards for NOx and PM are *already* "commercially available and economically feasible" and being required by MA DEP, as demonstrated by the

2011 air permit for Palmer Renewable Energy,[26] the biomass plant in Springfield that developers hope will benefit from these proposed regulations. For NOx, that permit states, "the combustion controls in conjunction with the HRSCR have been designed to meet a NOx emission rate of 0.055 lb/MMBtu based on a 1-hour block average, 0.017 lb/MMBtu based on any 12 consecutive month average." This standard is 15% lower than what DOER proposes. For PM, the permit states the filterable PM emission rate will be 0.008 lb/MMBtu, which is 33% lower than what DOER proposes.

In footnote 4 (page 4) of the Guideline, DOER also sets a CO limit and monitoring requirement and says it should be used as a proxy for PM emissions. If this is intended to be an available proxy under the guidance document, the requirement should be taken out of the footnote and put into the main text.

Recommendation: Revise the emissions control standards to be at least as stringent as those required in the 2011 air permit for the Palmer plant. Relocate the CO limit to the main text of the guidance document.

Eliminates requirement that units actually meet emissions criteria

Proposed 225 C.M.R. 14.05(1)(a)(7)(b): The existing requirement is for the unit to "*possess a Valid Air Permit and must demonstrate to the satisfaction of the Department that the emission rates of the Unit do not exceed limits set forth in the Guidelines*." DOER's proposal eliminates the language requiring the unit to demonstrate it can actually meet the limit.

Also, while it is unclear whether any facility in the RPS would be sufficiently small to *not* require an air permit, DOER has also eliminated language that requires plants *without* air permit requirements to demonstrate they can meet basic emissions criteria.

Recommendation: Retain the existing language.

Ignores the disproportionate impact of biomass plants located in environmental justice communities

Biomass plants can have serious localized pollution effects. Executive Order No. 552, the Executive Order on Environmental Justice, recognizes that "all people have a right to be protected from environmental pollution and to live and enjoy clean and healthy environment regardless of race, income, national origin or English language proficiency."[27] It further states that "[e]nvironmental justice populations are discrete and identifiable communities, mostly lower income and of color, that are at risk of being disparately and negatively impacted by environmental policies and overburdened by a higher density of known contaminated sites and by air and water pollution."[28] One plant likely to seek qualification for RECs under the Proposed

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[26] *Available at* http://www.pfpi.net/wp-content/uploads/2019/05/Palmer-Renewable-Energy_Non-Major-Conditional-Plan-Approval_06_30_11-FINAL.pdf.

[27] Mass. Exec. Order No. 552, at 3 (Nov. 20, 2014) (Gov. Deval L. Patrick), https://www.mass.gov/doc/executive-order-552-mass-register-1276/download.

[28] *Id*.

Regulations is the Palmer Renewable Energy, LLC facility proposed for East Springfield, Massachusetts. According to MassDEP's definitions for Environmental Justice population, the vast majority of Springfield meets one or more of three criteria for environmental justice communities.[29]

Residents of Springfield already struggle with the problems associated with significant and hazardous air pollution that degrades their air quality. Between 2015-2017, Hampden County experienced an above average number of high ozone days (4.5) and annual average concentrations of particle pollution (6.9 µg/m^3).[30] During the same time period the city of Springfield showed even higher averages for high ozone days (9.3) and annual average concentrations of particle pollution (12.4 µg/m^3).[31] Several factors contribute to Springfield's poor air quality including: multiple point sources of air pollutants (factories, power plants, and waste incinerators, including Covanta Springfield); the I-91 interstate running along the city and through neighborhoods; and the city's location in a valley where air pollution from other areas settles.[32] All these conditions have, unfortunately, led Springfield to be named the number one Asthma Capital by the Asthma and Allergy Foundation of America.[33]

For biomass to qualify for Massachusetts RECs, the RPS statute requires that the electricity is generated by a "low emission advanced biomass power conversion technologies."[34] However, when a facility is poorly sited, as is the case with the proposed Palmer plant in Springfield, incentivizing any level of additional particulate emissions is a dangerous policy choice and not credible in light of the statutory requirement for low emissions. The air permit for the proposed plant allows it to emit 34.55 tons of particulate matter and 13.2 tons of hazardous air pollutants annually, which includes heavy metals and carcinogens like formaldehyde and benzene. [35] In a community overburdened with poor air quality, building even a "low emission" biomass plant would only exacerbate the problem, adding damaging fine particulates and hazardous air

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[29] MassDEP identifies a Massachusetts community as an Environmental Justice community "if any of the following is true:

1. Block group whose annual median household income is equal to or less than 65 percent of the statewide median; or
2. 25% or more of the residents identify as a race other than white; or
3. 25% or more of the households have no one over the age of 14 who speaks English only or very-well – English Isolation."

Mass. Dep't of Envtl. Protection, *Environmental Justice Communities in Massachusetts: What Is an Environmental Justice Community?* (last visited June 6, 2019), https://www.mass.gov/info-details/environmental-justice-communities-in-massachusetts#what-is-an-environmental-justice-community?-.

[30] *See* AM. LUNG ASS'N, STATE OF THE AIR 2019, Massachusetts: Hampden (2019) (air quality report for Hampden County), https://www.lung.org/our-initiatives/healthy-air/sota/city-rankings/states/massachusetts/hampden.html.

[31] The 2012 National Ambient Air Quality Standard for annual PM2.5 set by EPA is 12 µg/m3.

[32] Pub. Health Inst. of W. Mass., *Air Pollution, Climate and Health in Hampden County* 1 (Feb. 1, 2019), https://www.publichealthwm.org/download_file/view/256/306.

[33] ASTHMA & ALLERGY FOUND. OF AM., *supra* note 15, at 6.

[34] G.L. c. 25A, §§ 11F(b)(8), (c)(7), (d)(8) (2019).

[35] MassDEP Conditional Air Permit for PRE Proposed Biomass-Fired Power Plant at 1000 Page Boulevard in Springfield, MA 15 (June 30, 2011). Available at http://www.pfpi.net/wp-content/uploads/2019/05/Palmer-Renewable-Energy_Non-Major-Conditional-Plan-Approval_06_30_11-FINAL.pdf.

pollutants where they can least be afforded. Based on the Commonwealth's environmental justice policies, DOER should categorically disallow RECs for any facility that would aggravate critical environmental conditions in an environmental justice community.

Recommendation: Categorically exclude emitting facilities located in or proximate to environmental justice communities already overburdened by particulate matter from eligibility for RECs.

III. DOER's proposal will increase CO2 emissions from wood-burning facilities

DOER's proposal will increase CO_2 emissions from wood-burning facilities by eliminating certain efficiency requirements and changing the methodology for the life cycle analysis. The amount of air pollution (both CO_2 and conventional) a biomass plant emits per unit of energy is a function of both its efficiency and the fuels it burns. More efficient plants wring more energy out of each unit of fuel, thus reducing the amount of fuel burned and associated CO_2 and air pollution emissions at the smokestack. However, even relatively efficient biomass plants emit considerably more CO_2 per unit of energy at the smokestack than coal or gas-fired plants (and far greater conventional pollution emissions than gas-fired plants).[36]

The "net" CO_2 emission rate, which is what the MA rules consider, is different from the smokestack CO_2 emission rate. The net amount of CO_2 a biomass power plant emits is assessed over a period of time (usually years) and is calculated as the additional cumulative CO_2 impact if the biomass plant is built and operated, versus if it is not. The net CO_2 emissions rate is partly a function of facility efficiency and direct CO_2 emissions per unit energy, as discussed above, but it also takes into account "offsetting" of CO_2 emissions by assuming that forests cut for fuel will regrow and sequester equivalent carbon, and "avoided" emissions from residues burned for fuel (e.g., tops and limbs left over after sawtimber harvesting) that are assumed to decompose and emit CO_2 anyway within years to decades if not burned for energy. The alternative fate is the key to determining whether something should be treated as residues; decomposition, or in very limited cases, burning for disposal, are the normal end fates for residues. The net emissions rate is highly dependent on the type of fuel burned. Generally, burning residues that would decompose anyway has a lower net emissions impact than cutting and burning trees that otherwise would have continued growing and taking CO_2 out of the atmosphere.

The net CO_2 emissions rate also depends on the timeframe of analysis. A longer timeframe involves more regrowth, and more CO_2 emitted from decomposition, with a smaller resultant difference between the bioenergy and no-bioenergy scenarios. This results in a lower net carbon impact.

The net emissions rate also depends on the additional emissions associated with growing, harvesting, processing, and transporting biomass fuels (HPT emissions). For example, while dried wood pellets tend to have lower stack emissions per unit energy than green wood chips, manufacturing the pellets produces significant emissions, including from fossil fuels used in the

[36] MANOMET STUDY, *supra* note 4, *at* 112.

process. "Lifecycle" emissions for a biomass fuel include *both* HPT emissions and the net biogenic CO_2 emissions from combustion of fuels.

The greenhouse gas impact of biomass plants over time is thus a function of at least *four factors:*

1. Facility efficiency;
2. Timeframe of analysis and whether emissions are offset;
3. Total lifecycle emissions, including HPT emissions; and
4. Type of fuel burned (residues that would otherwise decompose in a short time, persistent materials that would not; and trees that would continue growing).

In its proposal, DOER weakens and eliminates standards and accountability for all four factors.

A. Facility Efficiency

Reduces efficiency requirement for plants burning residues and thinnings

Proposed 225 C.M.R. 14.05(1)(a)(7)(c): "A Generation Unit utilizing an Eligible Biomass Woody Fuel or Manufactured Biomass Fuel that has 5% or more of its fuel sourced from Forest Derived Residues and Forest Derived Thinnings must achieve an overall efficiency of at least 50% on a quarterly basis."

DOER proposes to reduce the facility efficiency requirement from the existing requirement of 60% to 50% for plants burning forest residues and thinnings, an apparently arbitrary reduction. This reduction is unacceptable, because the 60% efficiency level is necessary for most facilities to show an appropriate reduction in net GHG emissions relative to fossil fuels, even if they are primarily burning residues.[37] There is no potential justification for this change, particularly since no electricity-only plant can achieve an efficiency level of 50% in any case. Therefore, if plants must necessarily be combined heat and power to achieve even the 50% efficiency threshold, they should be held to a reasonable standard of 60%, which is actually relatively low, compared to what the best CHP plants can achieve (see for example the list of "Energy Star CHP" award winners from EPA, which all exhibit efficiencies upward of 70%).[38]

Recommendation: At a minimum, retain the 60% efficiency requirement. More optimally, determine the efficiency level necessary to yield greenhouse gas emissions savings relative to a natural gas plant based on the Commonwealth's updated greenhouse gas reduction priorities. As discussed below, perform the analysis using the multi-year, not the single year GHG analysis.

Eliminates efficiency requirement for "salvage" wood and non-forest residues

Proposed 225 C.M.R. 14.05(1)(a)(7)(c): "A Generation Unit utilizing an Eligible Biomass Woody Fuel or Manufactured Biomass Fuel that has over 95% of its fuel sourced from Forest Salvage

[37] Mary S. Booth, Not Carbon Neutral: Assessing the Net Emissions Impact of Residues Burned for Bioenergy, 13 ENVTL. RES. LETTERS 035001, at 6 (2018), https://iopscience.iop.org/article/10.1088/1748-9326/aaac88.
[38] At https://www.epa.gov/chp/energy-star-chp-award-winners

and Non-Forest Derived Residues on a quarterly basis shall have no applicable overall efficiency requirement."

Impact: This change is not based in any credible science—it is not a reasonable assumption that the alternate scenario for these residues is higher-emitting than combustion in RPS-eligible facilities. This change also contradicts the conclusions of the Manomet Report, which concluded with regard to non-forestry residues that "importantly, the carbon profile of this material is generally similar to logging residues."[39] DOER itself proposes to account for carbon from non-forestry residues using the same carbon calculator as it uses for forestry residues, thus it is completely unacceptable to eliminate the efficiency requirement for this class of fuel. Additionally, DOER currently does not include any way to value "salvage" in the carbon calculator and is unclear how the carbon impact of salvage wood is to be accounted for.

Further, as described in the sections below, DOER has defined "residues" with an unreasonable scope, artificially reducing the potential carbon impact of those materials. We are also concerned about the enforceability of the feedstock tracking system.

It is also illogical to set the efficiency level of a plant eligible for incentives based solely on the fuels it will burn. The lifetime of a power plant is 20—40 years, and fuel sources for woody biomass operations change over time.

Recommendation: Retain original efficiency requirements, which were the product of a long scientific process and a huge amount of public input. Fix problems with existing carbon calculator.

B. Total Lifecycle Emissions, Including HPT Emissions

Eliminates definition and reporting of lifecycle GHG emissions

Proposed 225 C.M.R. 14.02: DOER proposes to *delete* the definition of "Lifecycle Greenhouse Gas Emissions" from the regulation, even though the assessment of full lifecycle emissions is the *entire point* of the RPS regulation.

This is the definition that DOER proposes to delete:

> Lifecycle Greenhouse Gas Emissions. The aggregate quantity of greenhouse gas emissions, including direct emissions and significant indirect emissions such as significant emissions from land use changes, and temporal changes in forest carbon sequestration and emissions resulting from biomass harvests, regrowth, and avoided decomposition as determined by the Department in consultation with the MassDEP and the Executive Office, related to the full fuel lifecycle, including all stages of fuel and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery of the finished fuel to the ultimate consumer, where the mass values for all greenhouse gases are adjusted to account for their relative global warming potential.

[39] MANOMET STUDY, *supra* note 4, *at* 36.

An important element of the current definition to be deleted is that the definition of lifecycle emissions is to be "determined by the Department in consultation with the MassDEP and the Executive Office." It is unclear whether DOER has consulted with DEP about the proposed changes. Given the lead role of DEP among EEA agencies in overseeing compliance with the Global Warming Solutions Act (GWSA), it is not acceptable that DOER appears to be unilaterally proposing to remove this provision.

Recommendation: Retain existing definition of Lifecycle Greenhouse Gas Emissions.

Eliminates fossil emissions from lifecycle accounting

The lifecycle definition that DOER proposes to delete states that lifecycle emissions are those "related to the full fuel lifecycle, including all stages of fuel and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery of the finished fuel to the ultimate consumer." 225 C.M.R. 14.02.

The 2012 version of the efficiency and GHG analysis spreadsheet includes GHG's emitted during biomass harvesting, processing, and transport (HPT), part of the complement of full lifecycle emissions (Figure 1).[40] However, the newly proposed *Guideline on Overall Efficiency and GHG Analysis* calculator simply excludes these emissions,[41] as does the carbon calculator for the Alternative Portfolio Standard.[42]

[40] *Guideline for the Calculation of Overall Efficiency and Lifecycle GHG Analysis*, Statement of Qualification Application (SQA), Worksheet for the Calculation of Lifecycle GHG Analysis *(*navigate to "GHG Analysis" worksheet*)* (last modified June 24, 2013).

[41] Proposed *Guideline on Overall Efficiency and GHG Analysis,* Statement of Qualification Application (SQA), Worksheet for the Calculation of Lifecycle GHG Analysis (navigate to "GHG Analysis" worksheet) (last modified Sep. 6, 2018).

[42] *Guideline on the Reduction of Greenhouse Gases for Eligible Thermal Renewable Generation Units Using Eligible Woody Biomass,* Statement of Qualification Application (SQA), Worksheet for the Calculation of Lifecycle GHG Analysis (navigate to "GHG Analysis" worksheet) (last modified Aug. 28, 2018).

Life Cycle Greenhouse Gas Analysis

Biomass Lifecycle Stack Emissions from Generation Unit		
Fuel Input	Wood Chips (green, 40% MC)	
	438000	green tons
	4467600	MMBTU_input annually
Bio-Product Credit	If Merchantable Bio-Products, provide under separate cover, a documentation of the embedded proportion and permanence of the input biomass fuel carbon in the Bio-Product.	
		% input carbon permanently embedded
CO2 Emissions	216.4	lbs CO2/MMBTU_input
	483393	tons CO2 annually

Biomass Fuel Processing Stack Emissions		
Provide, under separate cover, the Lifecycle GHG Analysis for Biomass Fuel Processing and enter re		
		tons CO2 annually

Conventional Lifecycle Stack Emissions Displaced		
Electric Generation	Natural Gas - Combined Cycle	If not NGCC, chose other from drop-dow
	317588	MWh annually
	1100	lbs CO2/MWh
	174603	tons CO2 annually
Thermal Boiler	Natural Gas, new	chose from drop-down list (if a new load, enter "Natural Gas, new")
	0	MMBTU_out
	85%	Boiler Efficiency (standard assumption)
		Boiler Efficiency (optional user input)
	0	MMBTU_in
	158.1	lbs CO2/MMBTU
	0	tons CO2 annually

"Biomass Fuel Processing Stack Emissions" (blue highlight), seen here in the existing calculator, has been *deleted* from the proposed calculator

Figure 1.

This is particularly troubling given that in most carbon accounting systems internationally, fossil emissions from biomass manufacturing and transport are the *only* emissions counted for bioenergy. DOER has not responded to comments regarding this change made during the rulemaking for the Alternative Portfolio Standard.[43] Excluding fossil emissions explicitly contravened the enabling statute of the APS, which requires "(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..." MGL Ch. 25A, § 11f1/2(b). It similarly conflicts with the statutory requirement that the RPS incentivize only "low emission" bioenergy. MGL Ch. 25A, § 11F(b)(8).

During the pendency of these proposed changes, DOER has stated that fossil lifecycle emissions are rolled into the estimates of GHG reductions produced by the Manomet Study, therefore these emissions (which are mostly from fossil fuels) can be removed from the carbon calculator.[44] However, DOER contradicted this position in correspondence during the proceedings for the 2017 amendments to 225 C.M.R. 16.00, stating (correctly) that the Manomet GHG emission calculations do *not* include HPT emissions.[45]

[43] P'ship for Policy Integrity et al., *supra* note 3, at 12 (under section titled "DOER's GHG accounting omits lifecycle emissions in contravention of the APS statute").
[44] Conversation between Mary Booth and Michael Judge in Amherst MA, May 16th 2019.
[45] E-mail from Bram Claeys to Mary Booth, PFPI (Jan. 13, 2015) ("The GHG calculations for woody biomass do indeed not take into account the manufacturing and transport energy. The calculation is taking the forest regeneration rate, and the energy efficiency of the energy generation equipment."). This correspondence was requested to be entered into the record as formal comments on the APS.

The Manomet Study indicates that pellet production emissions *should* be taken into account alongside boiler efficiency:

> Lifecycle Emissions from Pellet Applications: Emissions for thermal pellet applications require the addition of emissions from plant operations and for transport and distribution of pellets from the plant to the final consumer. The limited analysis that we have seen for these operations (for example, Katers and Kaurich, 2006) suggest that the increased efficiencies in boiler combustion achieved with pellets approximately offsets most of the increased emissions from plant operations and additional transport of pellets from the plant to their final destination.[46]

In the years since the Manomet Study was conducted, there have been a number of studies characterizing lifecycle emissions. The reference to the 2006 Katers and Kaurich study is not a valid reason for disregarding these emissions, which can be substantial. An analysis of data provided in the Katers and Kaurich study *itself* indicated that pellet manufacturing alone can expend an amount of energy than is close to 25% of the energy that is inherent in the fuel. A Canadian lifecycle study that includes transportation found the energy penalty was similar, at 29%.[47]

Finally, while DOER proposes to delete lifecycle emissions for wood fuels, it still appears to take these emissions into account for natural gas comparator. The lifecycle emissions for NGCC are still 1100 lb/MWh, which is clearly very high compared to actual emissions from NGCC plants. This value thus represents total lifecycle emissions. If such emissions are included for gas, they must be included for biomass, as well.

Recommendation: Retain and utilize carbon accounting for both fossil and biogenic fuels burned during wood chip and pellet processing and transportation. Add this accounting block to the carbon calculator used for the APS.

Counts fuel-drying as "useful" energy, thereby increasing net CO_2 emissions

Proposed 225 C.M.R. 14.02 ("Useful Thermal Energy"): Biomass plants get subsidies based on the "useful" energy that they generate, which is largely a function of efficiency. The drier the fuel, the less energy the plant spends boiling off water, and the greater the plant's efficiency. In the 2012 version of the regulations, energy used to dry fuel *prior* to combustion is not considered "useful" energy, as the CO_2 emitted during fuel-drying is not associated with energy produced for thermal or electric use. Emissions from energy expended during fuel drying clearly belong in the category of "lifecycle" emissions.

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[46] MANOMET STUDY, *supra* note 4, *at* 104 (emphasis added).
[47] Jill S. Craven, *Life Cycle Analysis of the Canadian Wood Pellet* (2008), http://www.pfpi.net/wp-content/uploads/2019/06/Craven_BioEn08.pdf.

Now, however, DOER proposes to allow energy used to dry fuels (wood pellets and chips) to qualify as "useful" energy as long as the fuel being produced is not burned at the same power plant as it was dried**.** Not only is DOER abolishing accounting of lifecycle emissions, it is redefining lifecycle emissions entirely, violating a basic principle of carbon accounting. This also defies logic. It is not clear what the material difference is between drying fuel to burn at the same plant and drying fuel to burn at a different plant, other than the additional fossil emissions from transporting the fuel to the other plant, which would in any case further *increase* the GHG footprint of the fuel.

Incentivizing fuel drying may also increase emissions of harmful criteria pollutants from a plant, including particulate matter and volatile organic chemicals.[48]

Recommendation: Do not count energy expended to dry fuel as "useful."

Ignores GHG impacts of methane emissions from wood chips and wood pellets

There are a variety of studies demonstrating that chip piles and even finished pellets can be significant sources of methane (some are listed in the Appendix). In light of the need for urgent climate action and accurate carbon accounting in the Commonwealth, DOER should include methane emissions from wood chip piles at biomass plants and fuel aggregators as part of lifecycle carbon emissions for biomass.

Generation of methane occurs under anaerobic conditions, the same conditions that lead to spontaneous combustion in wood chip piles at biomass and pellet plants. Various conditions expected to be found at biomass plants and pellet plants regionally are relevant. Studies[49] have found significantly greater rates of decomposition and mass loss for whole-tree chips than clean, debarked chips, and that piles of whole-tree chips are more prone to spontaneous combustion than clean, debarked chips.[50] Confinement of materials can also lead to buildup of gases; for instance oceanic transport of pellets, which are processed and dried and thus present less risk of fermentation than green chips, has nonetheless been found to sometimes result in dangerously high concentrations of toxic gasses during transport. One study found average methane concentrations of 605 ppm in the hold areas of vessels transporting wood pellets.[51]

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[48] *See* Mass. Dep't of Envtl. Protection, Conditional Approval of Palmer Renewable Energy, LLC 35 MW Biomass-Fired Power Plant (Jun. 30, 2011), http://www.pfpi.net/wp-content/uploads/2019/05/Palmer-Renewable-Energy_Non-Major-Conditional-Plan-Approval_06_30_11-FINAL.pdf ("PRE evaluated the use of fuel drying as part of the non-major comprehensive plan approval application and found that the costs, increase in PM and VOC emissions, along with other issues, far outweighed the potential efficiency gains from wood fuel drying. However, PRE will continue to evaluate fuel drying in the detailed design to determine if there is an economically viable method of drying the wood fuel without increasing VOC and PM emissions.").

[49] See the Appendix, *infra*, for abstracts from papers discussing methane emissions from stored chips and pellets.

[50] Edward L. Springer, *Should Whole-Tree Chips Be Dried before Storage?* 1 (Forest Prods. Lab., U.S. Dep't of Agric., Research Note No. FPL-0241, 1980).

[51] Urban Svedberg et al., *Hazardous Off-Gassing of Carbon Monoxide and Oxygen Depletion during Ocean Transportation of Wood Pellets*, 52 ANNALS OF OCCUPATIONAL HYGIENE 259, 263 tbl. 1 (2008).

Another study determined that methane emissions can be so large as to negate any GHG "benefit" of biomass, even before calculating the emissions from combustion of the fuel.[52]

Recommendation: Add calculation of methane emissions from chip and pellet storage to GHG calculator.

C. Timeframe of Analysis and Whether Emissions Are Offset

Incorrectly uses "single-year" approach for aggregate lifecycle accounting

Flaw in the current calculator

DOER's *current* approach to estimating GHG emissions, as set out in the GHG Guideline[53] established in 2012 (the "carbon calculator" spreadsheet) is incorrect because it does not utilize a protocol that complies with the current definition of lifecycle emissions. That definition includes the "aggregate quantity" of emissions "related to the full fuel lifecycle" including "emissions from land use changes, and temporal changes in forest carbon sequestration and emissions resulting from biomass harvests, regrowth, and avoided decomposition". 225 C.M.R. 14.02. Clearly, a multi-year period is envisioned, yet the current carbon calculator makes the "single-year" assessment the regulatory standard.

The goal of the 2012 version of 225 C.M.R. 14.00 was to ensure that the atmosphere "sees" lower greenhouse gas emissions from biomass than from a fossil comparator. For a period of assessment greater than one year, such as the 20-year timeframe set in the existing regulation, the only way to determine what the atmosphere sees is to use a multi-year approach. For example, applying this approach to "residues that would otherwise decompose," it is necessary to calculate the cumulative emissions from the smokestack in all of the 20 years of the timeframe, and then calculate *net* biomass emissions by subtracting out avoided decomposition emissions from the fuel burned in each year. However, the regulatory requirement under the current carbon calculator fudges the second step in a way that hides the true carbon impact of the biomass combustion by employing a single-year approach to calculating the carbon impact of burning biomass. Instead of reflecting the reality of increasing values of net biomass emissions over the 20 years (as Year One fuel would have substantially decomposed by Year Twenty, thus net emissions are low, but Year Nineteen fuel would hardly have decomposed at all, thus net emissions are high), it takes the net biomass emissions as of Year Twenty for fuel burned in Year One, and applies that to the smokestack emissions for Years Two through Twenty as well.

The results of the analysis are then compared to the emissions from a fossil fuel facility over 20 years to determine eligibility. The difference in the single- and multi-year analyses can be illustrated with an example of a 60% efficiency CHP biomass plant that emits 1.45 tons of CO_2 per year, compared to a fossil plant emitting 1 ton per year. Using DOER's pre-set

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[52] Mirjam Röder et al., *How Certain Are Greenhouse Gas Reductions from Bioenergy? Life Cycle Assessment and Uncertainty Analysis of Wood Pellet-to-Electricity Supply Chains from Forest Residues*, 79 BIOMASS & BIOENERGY 50 (2015).

[53] *See Guideline for the Calculation of Overall Efficiency and Lifecycle GHG Analysis*.

decomposition constant corresponding to a half-life of 5.5 years (which is too low to be realistic, as discussed below), repeating the single year analysis 20 times using the DOER approach leads to the conclusion that net biomass emissions are 2.2 tons, an 87.6% reduction compared to the 20 tons emitted by the natural fossil fuel plant (Figure 2). This analysis qualifies the plant for subsidies. However, doing it the correct way with the multi-year analysis, the net biomass emissions are 10.56 tons, a 47.2% reduction from the fossil-fired plant. This analysis is an accurate measure of what the atmosphere sees, and does not qualify the plant.

Carbon Debt/Dividend Analysis			
	Carbon Debt	115994	tons CO2 annually
		31.0%	carbon debt, %
	Biomass Supply Information		
	Residues	100%	% of supply
	Forest Derived Thinnings	0%	% of supply (calculated - Supply must sum to 100%)
	Net CO2 Emission Reductions		
Regulatory Requirement	Applicant must demonstrate at least a 50% reduction by Yr 20 (1-Yr Analy)	1-Year Analysis	
		87.6%	% reduction in Year 20
	Based on 30 year project life (results for Year 50 allows for residue decay and forest recovery without additional project emissions post Year 30)	Multi-Year Analysis	
		17.7%	reduction in Year 10
		47.2%	reduction in Year 20
		62.6%	reduction in Year 30
		97.0%	reduction in Year 50

Figure 2.

The Manomet Study included the "single year" analysis as a building block that is a necessary constituent of the multi-year analytical approach, which in turn is necessary for estimating cumulative net emissions and carbon impacts. Estimating cumulative net emissions and carbon impacts was the reason for conducting the Manomet Study in the first place:

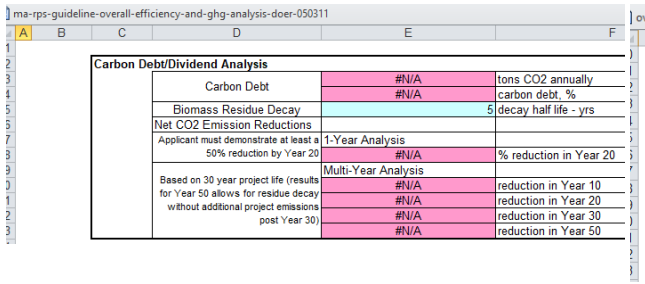
> The conceptual modeling framework for this study is intended to address the question of how atmospheric GHG levels will change if biomass displaces an equivalent amount of fossil fuel generation in our energy portfolio. With this objective, the modeling quantifies and compares the cumulative net annual change in atmospheric CO2e for the fossil and biomass scenarios, considering both energy generation emissions and forest carbon sequestration.[54]

The original carbon calculator published by DOER includes the multi-year calculations and the ability to generate the cumulative carbon impact, but DOER has deleted all this in the proposed version of the calculator. This is not acceptable, and must be remedied in any revision of 220 C.M.R. 14.00 and accompanying guidance. The international scientific community has established, and the Commonwealth has acknowledged, a drastic need to cut greenhouse gas emissions in the near term. If we incentivize a new biomass plant through the RPS in 2020, in order to determine whether it will result in lower greenhouse gas emissions than a natural gas plant (the marginal emitter in the regional grid) by 2040, we need to accurately adjust the

[54] MANOMET STUDY, *supra* note 4, at 96.

smokestack emissions from each year between 2020 and 2040, which requires the multi-year analysis.

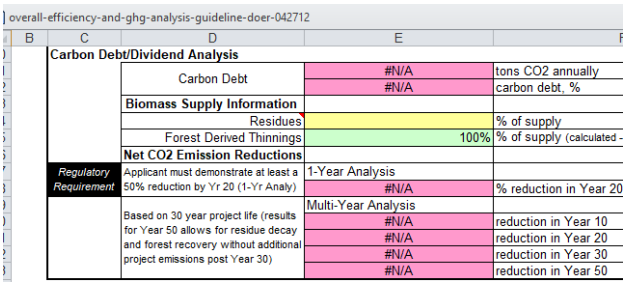
It is also important to note that DOER does not appear to have alerted stakeholders to the decision to make the single-year approach the regulatory requirement under the current regulations. The initial carbon calculator available for review during the proceedings promulgating the current 225 C.M.R. 14.00 does not show the one-year approach would be the regulatory requirement. Figure 3a shows the 05-03-11 version of the carbon calculator that was put out for review; Figure 3b shows the final 04-27-12 version that was published as final. If the single year approach had been indicated as constituting the regulatory requirement during comment process, stakeholders including the undersigned would have roundly rejected it.[55]



ma-rps-guideline-overall-efficiency-and-ghg-analysis-doer-050311

Carbon Debt/Dividend Analysis			
	Carbon Debt	#N/A	tons CO2 annually
		#N/A	carbon debt, %
	Biomass Residue Decay	5	decay half life - yrs
	Net CO2 Emission Reductions		
	Applicant must demonstrate at least a 50% reduction by Year 20	1-Year Analysis	
		#N/A	% reduction in Year 20
	Based on 30 year project life (results for Year 50 allows for residue decay without additional project emissions post Year 30)	Multi-Year Analysis	
		#N/A	reduction in Year 10
		#N/A	reduction in Year 20
		#N/A	reduction in Year 30
		#N/A	reduction in Year 50

Figure 3a.



overall-efficiency-and-ghg-analysis-guideline-doer-042712

Carbon Debt/Dividend Analysis			
	Carbon Debt	#N/A	tons CO2 annually
		#N/A	carbon debt, %
	Biomass Supply Information		
	Residues		% of supply
	Forest Derived Thinnings	100%	% of supply (calculated -
	Net CO2 Emission Reductions		
Regulatory Requirement	Applicant must demonstrate at least a 50% reduction by Yr 20 (1-Yr Analy)	1-Year Analysis	
		#N/A	% reduction in Year 20
	Based on 30 year project life (results for Year 50 allows for residue decay and forest recovery without additional project emissions post Year 30)	Multi-Year Analysis	
		#N/A	reduction in Year 10
		#N/A	reduction in Year 20
		#N/A	reduction in Year 30
		#N/A	reduction in Year 50

Figure 3b.

Flaw in the proposed version of the calculator

In the current proceeding, DOER is proposing to delete the multi-year calculation worksheets entirely from the GHG calculator. The instructions page in the calculator excel workbook also makes the abandonment of the multi-year approach clear, stating, "*The GHG Analysis worksheet and its supporting worksheets are provided by DOER as a template for the RGU to demonstrate that it meets the regulatory criterion of reducing lifecycle Greenhouse Gas Emissions by at least 50% over 30 years compared to a natural gas combined cycle electricity generation unit (based on single year analysis)*."

Leaving aside the fact that the carbon calculator is here referring to "lifecycle Greenhouse Gas Emissions," a concept that is no longer defined in the regulation, the use of the single-year approach is incapable of delivering lifecycle emissions as commonly understood in the biomass carbon accounting literature.[56] Unless one plans to operate a biomass facility for one year and

[55] *See, e.g.*, MARY S. BOOTH, REVIEW OF THE MANOMET BIOMASS SUSTAINABILITY AND CARBON POLICY STUDY (2010), http://www.pfpi.net/wp-content/uploads/2011/03/Manomet-Study-Review.pdf (discussing the difference between the single- and multi-year approaches).

[56] *See, e.g.,* Domke, G. M., D. R. Becker, A. W. D'Amato, A. R. Ek and C. W. Woodall (2012). "Carbon emissions associated with the procurement and utilization of forest harvest residues for energy, northern Minnesota, USA." Biomass and Bioenergy 36: 141-150; Laganière, J., D. Paré, E. Thiffault and P. Y. Bernier (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; Walker, T., P. Cardellichio, J. S. Gunn, D. S. Saah and J. M. Hagan (2013). "Carbon Accounting for Woody Biomass from Massachusetts (USA) Managed Forests: A Framework for Determining

then shut it down, a 20-year lifecycle analysis requires that all the emissions from all 20 years be assessed.

In place of the single-year approach, DOER should retain the multi-year calculation worksheets and make the multi-year approach the regulatory requirement. This is standard practice in bioenergy carbon accounting and is necessary for the calculator to perform the function for which the entire biomass regulation was constructed in 2012 (ensuring that only biomass that genuinely reduces net emissions compared to the fossil fuel comparator receives renewable energy subsidies), or for the Commonwealth to claim any carbon reductions from biomass Class I RECS going forward. Logistically, requalifying a plant each year using this approach is no more work than qualifying it each year using the single-year approach. DOER can project forward the anticipated fuel mix for the facility over the 20 years to generate the initial net emissions calculation, then update the data with each year's fuel mix, just as they estimate each year's single year carbon impact with the current year's fuel mix.

It is not clear why DOER has chosen to also include the GHG accounting worksheets within the other excel workbook it provides, the "Guideline on Biomass Fuel Report Draft 09-06-18," but the single-year accounting flaw should be fixed there as well.

Recommendation: Retain the multi-year calculation worksheet, and make the multi-year approach the regulatory requirement for lifecycle GHG accounting.

Eliminates other references to 20-year accounting requirement

Proposed 225 C.M.R. 14.02, definition of "Percent Under-compliance": A reference to the 20-year accounting requirement has been removed and replaced by a requirement for determination on an annual basis.

Recommendation: DOER should retain the reference to the 20-year timeframe and clarify that annual reporting still requires cumulative assessment of the entire 20-year GHG impact using the multi-year approach, as required in the original regulation.

Changes requirement to show required GHG reduction from 20 years to 30 years

Proposed 225 C.M.R. 14.05(1)(a)(7)(d): To qualify for subsidies under the RPS currently, biomass plants must demonstrate via carbon accounting that their cumulative net emissions are no more than 50% those of an efficient natural gas plant at year 20.[57] This was a policy decision left to the agency by the Manomet Study, and was based on DOER and DEP's understanding of their carbon emission reduction charge from the electric sector in 2012.[58] DOER undermined this

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the Temporal Impacts of Wood Biomass Energy on Atmospheric Greenhouse Gas Levels." Journal of Sustainable Forestry 32(1-2): 130-158.

[57] 225 C.M.R. 14.05(1)(a)(7)(f)(iii).

[58] *See* MANOMET STUDY, *supra* note 4, at 6 ("The goal of the report is to inform the development of DOER's biomass policies by providing up-to-date information and analysis on the scientific and economic issues raised by these

requirement in the APS, increasing the timeframe to 30 years, despite vehement opposition from the climate science community and undersigned groups.[59] It is patently illogical to extend this practice to the inherently less efficient electric standard (particularly when DOER is removing efficiency standards for many types of fuel). Rather than weakening the standards for electric biomass generators, DOER should require a carbon benefit calculation over *ten* years, in light of the IPCC's latest findings on the need to immediately decrease emissions and massively increase carbon uptake into forests.

Recommendation: Reduce the timeframe to ten years to reflect the urgency of the climate crisis.

Allows "offsetting" of emissions violations from year to year

Proposed 225 C.M.R. 14.05(8)(f): DOER proposes to subject facilities to "probationary" status if they "undercomply" with the regulation's modest GHG targets by over-emitting net GHGs. However, DOER maintains an unacceptable loophole from the 2012 rules that allows facilities to use past "overcompliance" in the probationary period.

Recommendation: The probationary period "overcompliance" allowance should be removed.

D. Type of Fuel Burned

DOER's changes have greatly expanded the types of wood that can be burned to generate renewable energy subsidies, both in the Renewable Portfolio Standard and the Alternative Portfolio Standard.

The main theme seems to be to expand the amount of fuel that is classified as "residues." The Manomet framework and the original DOER carbon accounting framework treat residues as having a relatively low net carbon impact, because these materials are assumed to be a by-product of some other process, which would decompose and emit CO_2 if not burned for energy.[60] The net increase in CO_2 emissions when this material is burned is less than the net increase when whole trees cut for fuel are burned, because if the trees would have either continued growing and sequestering CO_2 out of the atmosphere if they were not cut and burned, or would be harvested for some other use.[61]

The only "residues" that can legitimately be considered as material that "would decompose anyway" are sawdust and other products from mills ("mill residues") that have no other use; tops and limbs that are typically left onsite after sawtimber harvesting ("forestry residues");

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questions. We have not been asked to propose specific policies except in the case where new approaches may be needed to protect the ecological functioning of forests.").

[59] *See* P'ship for Policy Integrity et al., *supra* note 3, at 15.

[60] MANOMET STUDY, *supra* note 4, at 174 ("The use of logging slash for energy production has a lower carbon impact than the use of live trees for energy because logging slash will decay and emit carbon and other greenhouse gases, while live trees will continue to sequester carbon.").

[61] In this case, the "other users" displaced by biomass harvesting harvest other trees to make their products, resulting in carbon leakage and increased GHG emissions overall.

and some urban waste wood (for instance, wood trimmed to keep powerlines clear, and a limited amount of post-consumer wood). Contrary to DOER's assumptions, landfilled wood residues actually decompose extremely slowly—and in fact, EPA's national level GHG reporting treats wood in landfills as a category of sequestered carbon.[62]

The Manomet Study was clear that "logging residues" is a restricted category, defined in the study as the "tops and limbs associated with harvesting trees." [63] This is the only forestry material that can legitimately be said to have few other markets, meaning it is often left onsite to decompose. However, this is a relatively small pool of material (Manomet and others estimate around 100,000 tons per year in MA). DOER is now proposing to dramatically expand the amount of wood that will be *classified* as "residues", without the scientific justification of Manomet's or any other analysis. DOER is also proposing to expand the amount of wood that is to be considered "salvage," with a corresponding assumption of low net carbon emissions from combustion.[64]

Over-represents benefits of forestry residues

An aspect of the current regulations that needs to be strengthened rather than weakened is the GHG calculator's treatment of residues. The current calculator assumes that forest residues have a half-life of 5.5 years, corresponding to a k-factor (decay constant) of 0.126,[65] which they claim is "representative of small diameter woody material decay on the forest floor."[66] This represents the benchmark against which the GHG emissions from combustion are measured.

The literature DOER cites[67] in the GHG calculator in support of this k-factor actually supports choosing a much lower value. For instance, the decay rates in one paper cited by the calculator are much lower (0.0428, 0.0473, 0.0622, 0.0947, 0.0773, 0.1085) than the 0.135 value DOER chose.[68] Another cited study found a k-factor of 0.083.[69] A cited study from California explicitly

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[62] ENVTL. PROTECTION AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS 1990-2017, at 6-2 tbl. 6-1 (2019) (showing a net sequestration value for yard waste in landfills), https://www.epa.gov/sites/production/files/2019-04/documents/us-ghg-inventory-2019-main-text.pdf.

[63] MANOMET STUDY, *supra* note 4, at 39 (see Section 3.2.2.1).

[64] The Proposed *Guideline on Overall Efficiency and GHG Analysis* omits any decomposition emissions term for "salvage" wood, making it difficult to estimate the full extent of the carbon assumptions.

[65] The decomposition constant for non-forest residues is even lower, at 5.0 years half-life, or 0.136. There is no scientific justification for this value.

[66] *Guideline for the Calculation of Overall Efficiency and Lifecycle GHG Analysis*, Statement of Qualification Application (SQA), Worksheet for the Calculation of Lifecycle GHG Analysis (last modified June 24, 2013) (navigate to "Carbon Dividend Framework" worksheet).

[67] *See id.* (citing Benktesh D. Sharma et al., *Modeling Forest Biomass in Atmospheric Carbon Reduction in West Virginia*, PROC. 33RD ANN. MEETING OF THE COUNCIL ON FOREST ENGINEERING: FUELING THE FUTURE (2010); Grant M. Domke et al., *Assessment of Carbon Flows Associated with Forest Management and Biomass Procurement for the Laskin Biomass Facility* (Dep't of Forest Res., Univ. of Minn., Staff Paper Series No. 198, 2008); Kim G. Mattson et al., *Decomposition of Woody Debris in a Regenerating, Clear-Cut Forest in the Southern Appalachians*, 17 CAN. J. FOREST RES. 712 (1987)).

[68] *See* Domke et al., *supra* note 54.

[69] Mattson et al., *supra* note 54, at 716.

factors emissions from Californian wildfires into the decay rate for residues,[70] an assumption that is inappropriate to extend to a Northeastern forest. The majority of residues used for bioenergy are large-to-medium diameter. Region-specific decomposition rates for coarse woody debris used in modeling by an EPA task force on bioenergy carbon dynamics are much lower than the rate used by DOER, at 0.053 for softwoods and 0.069 for hardwoods. The average of these two factors is less than one-half the decomposition that DOER is using.[71]

Recommendation: DOER should revise the carbon accounting calculator to use residue decomposition rates that are scientifically justified for Northeastern forests.

Defines trees damaged during logging operations as "residues"

Proposed 225 C.M.R. 14.02: Adds "trees collaterally damaged" during harvesting to definition of "Forest Derived Residues" under definition of "Eligible Biomass Woody Fuel".

Impact: Damaged trees do not meet the Manomet definition of residues. In fact, the Manomet Study explicitly avoided including this category, stating that "breakage and residual stand damage" should *not* qualify as residues.[72] There is no scientific justification for assessing the GHGs emitted from combustion of collaterally damaged trees at the decay rate of "small diameter woody material," or even coarse woody debris. Many of these trees are damaged from a product value standpoint but would continue to grow and sequester carbon for a significant period of time, and incentivizing their removal is damaging to forest ecosystem function. The majority of such harvesting does not meet the Manomet definition of residues, meaning tops and limbs that would otherwise decompose.

Recommendation: Withdraw this change.

Defines trees harvested for restoration as "residues"

Proposed 225 C.M.R. 14.02 ("Eligible Biomass Woody Fuel"): Expands definition of "Forest Derived Residues" to include "Trees and portions of trees harvested for the purposed of the restoration and management of habitat for rare & endangered species."

Impact: Similarly to collaterally damaged trees, there is no scientific justification for assuming that trees harvested for habitat restoration would otherwise decay at the same rate as forestry residues. The majority of such harvesting does not meet the Manomet definition of residues, that is, tops and limbs that would otherwise decompose.

Recommendation: Withdraw this change.

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[70] *See* GREGORY MORRIS, NAT'L RENEWABLE ENERGY LAB., BIOMASS ENERGY PRODUCTION IN CALIFORNIA: THE CASE FOR A BIOMASS POLICY INITIATIVE 39–48 (2000).

[71] US EPA 2014 Framework for Assessing Biogenic CO2 Emissions from Stationary Sources, Appendix L: Illustrative Forestry and Agriculture Case Studies Using a Future Anticipated Baseline, table L-15, FASOM-GHG Annual Coarse Woody Debris Decomposition Rates (Washington, DC: US Environmental Protection Agency, Office of Air and Radiation, Office of Atmospheric Programs, Climate Change Division). Page 256 of pdf at https://yosemite.epa.gov/sab/sabproduct.nsf/0/3235DAC747C16FE985257DA90053F252/$File/Appendixes+A-N.pdf.

[72] MANOMET STUDY, *supra* note 4, at 39 (see Section 3.2.2.1).

Massively increases amount of wood classified as "salvage"

Proposed 225 C.M.R. 14.02: "Salvage Trees" are defined in the current definition of "Eligible Biomass Woody Fuel" as "Damaged, dying or dead trees removed due to injurious agents, such as wind or ice storms or the spread of invasive epidemic forest pathogens, insects and diseases or other epidemic biological risks to the forest, but not removed due to competition."

As discussed in Section III.A., supra, DOER proposes to remove any efficiency requirement for biomass power plants that burn "salvage" wood. Here, they greatly expand the amount of wood classified as "salvage", with no alternative disposal scenario carbon accounting whatsoever.

Under the existing definition, an individual tree itself must be a major threat to qualify as salvage. 225 C.M.R. 14.02 ("Such eligible trees may be removed without limitation for biomass fuel, only if a major threat to forest health or risk to private or public resources") (emphasis added). There is no net GHG assessment in the current calculator for this category of fuels.[73] While we recommend that an emissions factor be included for this type of salvage, the tree-by-tree threat assessment reasonably served to justify its omission as a de minimis source of net GHGs under the current framework. Under the proposed definition, any tree "damaged" by an "injurious agent" can be removed without limitation for biomass fuel if the injurious agent is declared a major threat by a federal or state agency. Proposed 225 C.M.R. 14.02 ("Such eligible trees may be removed without limitation for biomass fuel, only if the injurious agent is a threat to forest health or risk to private or public resources") (emphasis added). This represents a potentially massive expansion of fuel availability; for instance, mature oak trees that have been impacted to any extent by gypsy moth caterpillars could now be classified as "salvage." In addition to the poor policy justification for incentivizing combustion of this large a category of trees, there is no scientific justification for assuming low net carbon impact from such combustion.

Recommendation: Retain the existing definition of salvage, and assign this material an emissions impact factor based on likely alternative disposal scenarios.

Expands definition of mill residues

Proposed 225 C.M.R. 14.02: Under the definition of "Non-forest Derived Residues", using mill residues as fuel is commonly assumed to have little net GHG impact. However, creating a market for them for biomass can divert them from other uses, such as conversion to particleboard. The regulations currently define mill residues as "1. Primary Forest Products Industry. Lumber mill residues or lumber processing residues consisting of the slabs, shavings, trimmings, sawdust, bark, end pieces of wood, and log cores that result from the various processing operations occurring in sawmills, pulp mills, and veneer and plywood plants" and "2. Secondary Forest Products Industry. Wood waste produced as a byproduct of the production of

[73] *See Guideline for the Calculation of Overall Efficiency and Lifecycle GHG Analysis*.

finished wood products, including but not limited to clean residues from woodworking shops, furniture factories, and truss and pallet manufacturing."

DOER proposes to replace both of these definitions with "Forest products industry: Residues derived from wood products manufacturing consisting of Clean Wood."

Impact: Such an expansive definition, combined with lucrative subsidies, opens up the possibility that mills will be used to grind wood specifically for fuel, which is a corruption of the intent of the word "residues." DOER cannot stop this from occurring once the definition is in place.

Recommendation: Retain the old definition and strengthen it to clarify that residues can only be considered qualifying if they are *genuinely* the by-product of a process designed to manufacture another primary product.

Classifies "post-consumer wood" as non-forestry residues with minimal carbon impact

Proposed 225 C.M.R. 14.02 ("Non-forest Derived Residues"): DOER has proposed to remove the eligibility of "non-treated pallets" and add "post-consumer wood waste" to the list of non-forestry residues.

The decay constant DOER is using for such materials produces a half-life of about five years, which is extremely short for such materials. It is also *not* reasonable to assume the alternative fate for this material is decomposition, since much of it could be reused or recycled. Additionally, DOER's deleting of the term "non-treated pallets" potentially means that pallets treated with pesticides are now eligible fuel.

Recommendation: Retain the old definition of "Wood Waste" and exclude as much material as possible to encourage recycling.

Includes agricultural wood waste as non-forestry residues with minimal carbon impact

Proposed 225 C.M.R. 14.02: "Wood Waste" is defined to include "Pruned branches, stumps, and whole trees resulting from maintenance activities directly related to the production of an agricultural product."

Impact: This appears to refer to orchard trimmings, but if "agricultural product" is also considered to include plantation trees, then the inclusion of "whole trees" is not justified.

Recommendation: Make it clear in this definition that the materials must represent only true residues from orchards.

Retains classification of trees cut for agriculture as non-forest residues

Proposed 225 C.M.R. 14.02: Under the definition of "Land use change-agricultural" DOER retains the treatment of trees harvested for agricultural land-use change from the previous version of the regulations. As explained above, it is not legitimate to treat wood harvested from land use change as having low or zero carbon emissions.

Recommendation: Add trees harvested during land use change either for development or agriculture as a full emission where GHG's are never recouped, and assign this carbon footprint to the biomass thus derived. Amortize the impact over a ten-year period.

Appears to contemplate co-firing of biomass with coal or garbage

There is little mention of co-firing biomass in the regulations, but one section of the Guideline on Eligible Biomass suggests that co-firing biomass with non-eligible fuels such as coal or garbage may be permitted to generate renewable energy credits. Discussing emissions standards, the Guideline states, "*In the case of a RGU that uses any solid Eligible Biomass Fuel(s)* ***in conjunction with any ineligible fuel(s),*** *whether by co-firing such fuels or by using a composite fuel, these size ranges and emission limits apply to the entire Unit, per the provisions at 225 CMR 14.05(3)(b)*."

Recommendation: DOER should clarify that no facility burning any ineligible fuel can qualify for generating renewable energy credits.

E. Positive or neutral changes

Removes eligibility of energy crops

Proposed 225 C.M.R. 14.02: DOER appears to have eliminated eligibility of dedicated energy crops. Such crops are not consistent with EEA's long term biosequestration goals, and land conversion to their use can harm biodiversity and terrestrial carbon storage.

Defines fewer trees as "thinnings"

Proposed 225 C.M.R. 14.02: DOER appears to have reduced the number of trees potentially defined as "Forest Derived Thinnings" under "Eligible Biomass Woody Fuel" by reducing the potential sawlog length. The current definition, "Unacceptable growing stock which is defined as trees considered structurally weak or have low vigor and do not have the potential to eventually yield a 12 foot sawlog or survive for at least the next ten years", has been changed to eight-foot sawlog. We understand this to have the effect of placing more trees of different sizes in the category of potential sawlog, making them inappropriate for taking as thinnings. The full ramifications of this change are not clear, however. For instance, it is not clear if this limit will apply even to species that are not typically harvested for sawtimber. Will these be considered thinnings or residues?

Recommendation: Clarify that the improved definition of "thinnings" applies only to species ordinarily harvested for sawtimber. However, given that plants burning thinnings generally cannot meet the current requirements for a reduction in net carbon emissions, a better solution is to remove thinnings from eligibility altogether.

Removes classification of trees harvested for development as non-forest residues

Proposed 225 C.M.R. 14.02: DOER proposes to remove trees harvested during non-agricultural land-use change (i.e., development) from the list of "Non-forest Derived Residues" under the definition of "Eligible Biomass Woody Fuel". The assumption behind the treatment of "residues" as having relatively low net GHG impact is that this material would otherwise decompose. It is extremely unlikely that this would be the fate for wood harvested during conversion of forest to development, and therefore, its classification as "residues" was never legitimate. Importantly, international carbon accounting protocols recognize that trees harvested from land-use change (either for development or agriculture) will never grow back, so the carbon emissions are never offset.

Disqualifies yard waste as fuel

Proposed 225 C.M.R. 14.02: DOER has removed yard waste from the list of "Non-forest Derived Residues" under the definition of "Eligible Biomass Woody Fuel". This is for the best, as this makes a terrible fuel—it is wet, potentially contaminated, and would degrade facility efficiency. Yard waste should be diverted to compost wherever possible.

IV. The Proposal improves some elements of liquid/gaseous biofuels regulation, but requires tightening

DOER has proposed significant changes to standards for liquid and gaseous fuels, with mixed results. The proposed definition of Eligible Liquid Biofuels appropriately eliminates feedstocks that are not derived from waste, and by operation of federally defined terms, would currently retain the requirement that liquid biofuels achieve at least a 50% reduction in Lifecycle Greenhouse Gas Emissions from the baseline fuel they displace. However, the language as drafted leaves open loopholes that DOER should close before finalizing a change to the Eligible Liquid Biofuels and Eligible Biogas definitions. Further, it is not clear whether wood is an eligible feedstock for liquid and gaseous fuels.

Relies on EPA's controversial RFS2 definitions for fuel qualification

Proposed 225 C.M.R. 14.02 ("Eligible Liquid Biofuel"): Currently, the rule requires GHG accounting to be done to ensure that unless made from food waste, liquid biofuels "yield at least a 50% reduction in Lifecycle Greenhouse Gas Emissions relative to average lifecycle greenhouse gas emissions for petroleum distillate fuel sold in 2005." DOER's proposed rule eliminates this requirement and replaces it with a requirement that the fuel meet "the standards for advanced biofuels under the Environmental Protection Agency's Renewable Fuel Standard (RFS2) program." The accompanying *Guideline on Eligible Biomass Fuel* further states, "Because of this provision, all Eligible Liquid Biofuel and bio-oil is considered to have met the

50% reduction in GHG emissions and is not required to provide additional analysis, unless requested by the Department."[74]

DOER should not rely on a policy as controversial as the federal RFS for qualification of fuels. The RFS is a highly controversial policy that has failed to materially reduce transportation sector GHG emissions.[75] The RFS is also the product of numerous political compromises that Massachusetts, as a leader among US states in the fight against climate change, need not and should not accede to—we can and must do better. Further, EPA's pathway determinations for RFS-eligible biofuels are procedurally and substantively problematic and should not be extended into other policies.

Additionally, DOER proposes to delete the following highlighted portion of the current definition of "eligible liquid biofuel":

> *Eligible Liquid Biofuel. A liquid fuel that is derived from Eligible Biomass Fuel, but is not Eligible Biomass Woody Fuel or Co-mingled Biomass Woody Fuel, and that yields at least a 50% reduction in Lifecycle Greenhouse Gas Emissions relative to average lifecycle greenhouse gas emissions for petroleum distillate fuel sold in 2005,* ***as determined by the Department in consultation with the MassDEP and the Executive Office.***

220 C.M.R. 14.02 (emphasis added). It is not clear whether DOER's deletion of this language would make it possible to use wood as feedstock. The list of feedstocks as "included" but "not limited to" waste oils, etc, appears to make this possible. DOER should clarify that wood cannot be used as a feedstock; if wood is a potential feedstock, it is unacceptable for DOER to attempt to undermine science-based GHG accounting in this way.

Similar to the definition of Lifecycle Greenhouse Gas Emissions discussed in Section III.B., *supra*, it is illogical to remove the requirement for DOER to consult on lifecycle carbon emission issues with DEP, the office charged with GWSA compliance and the department primarily responsible for carbon accounting.

Requiring an Eligible Liquid Biofuel to both be derived from waste and achieve a 50% lifecycle greenhouse gas emission reduction is a positive change. DOER should effectuate this intent by replacing the proposed reliance on EPA's RFS2 program with the current Massachusetts-based lifecycle greenhouse gas analysis conducted by DOER in consultation with DEP and EEA.

Impact: This change is likely to increase use of carbon-intensive biomass as feedstock for liquid biofuels, but consider the resulting fuels to have zero net biogenic carbon emissions, directly contravening the statutory low emissions requirement.

Recommendation: Implement the tighter proposed definition of Eligible Liquid Biofuels, but retain the requirement that DOER and DEP conduct the lifecycle greenhouse gas emissions analysis.

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[74] Proposed *Guideline on Eligible Biomass Fuel for Renewable Generation Units,* at 3.

[75] See Clean Air Task Force, The RFS's Unhappy Birthday: A Mistake Turns 10 (Dec. 18, 2017), https://www.catf.us/2017/12/rfs-unhappy-birthday/.

Allows use of any organic material as feedstock for liquid fuels, potentially including contaminated waste

Proposed 220 C.M.R. 14.02, definition of "eligible liquid biofuels": Currently, only "eligible biomass fuels" or waste feedstocks from food wastes that would otherwise be discarded are eligible feedstocks for liquid biofuels. The proposed rule creates a pathway for almost any organic material—including construction and demolition wood, or contaminated wastes, to be used as feedstock.

The apparent permission to supply feedstock from construction and demolition waste, which usually contains heavy metals and other toxins, occurs where the prohibition on using C&D waste is removed from the definition of eligible liquid biofuel under the definition of "Eligible Biomass Fuel" in Proposed 225 C.M.R. 14.02. While woody C&D waste is prohibited by the Eligible Woody Biomass Fuel definition's cross reference to the definition of Clean Wood in 310 C.M.R. 19.006, no such prohibition is clear for Eligible Liquid Biofuel. If this is not the result DOER intended, an explicit C&D prohibition should be added to the definition of Eligible Liquid Biofuel and/or Eligible Biomass Fuel. If it is the result DOER intended, DOER should reverse this decision.

Impact: These changes could incentivize use of contaminated wood as feedstock for liquid fuels.

Recommendation: Explicitly prohibit liquid biofuels derived from C&D waste.

Removes primary role of DEP to govern waste-derived feedstocks

Proposed 225 C.M.R. 14.02: The proposed definition of "Eligible Liquid Biofuel" places the primary decision-making power regarding the treatment of hazardous waste as a feedstock with DOER: "Eligible Liquid Biofuel shall not include petroleum-based waste or Hazardous Waste as defined in 310 C.M.R. 40.0006: Terminology, Definitions, and Acronyms, unless otherwise determined by the Department in consultation with MassDEP." (emphasis added). The current definition states, "Waste feedstock shall not include petroleum-based waste or waste that otherwise meets the definition of hazardous waste, unless otherwise determined by MassDEP."

DEP is better qualified than DOER to make determinations regarding the disposition of hazardous waste, and DOER gives no reason for the change.

Recommendation: Retain DEP as sole decisionmaker for the treatment of hazardous waste under this standard.

Defines new category, "Eligible Biogas Fuel"

Proposed 225 C.M.R. 14.02 ("Eligible Biogas Fuel"): DOER defines this new category as "gaseous fuel that is produced by the contemporaneous bacterial decomposition or thermal gasification of Eligible Biomass Fuel."

There are several issues that arise regarding this proposed change.

DOER defines eligible biomass fuel as being derived from eligible biomass fuel. That list includes the following:

(a) Eligible Biomass Woody Fuel;

(b) Manufactured Biomass Fuel;

(c) Eligible Biogas Fuel

(d) by-products or waste from animals or agricultural crops;

(e) food or vegetative material;

(f) algae;

(g) organic refuse-derived fuel; and

(h) Eligible Liquid Biofuel.

See Proposed 220 C.M.R. 14.02, definition of "eligible biomass fuel". In the proposed regulation, DOER has removed "anaerobic digester gas" and "Landfill methane gas" from the list of Eligible RPS Class I and Class II Renewable Fuels. Presumably, these categories are aggregated into the proposed category of "Eligible biogas fuel." Along with these two technologies, which differ greatly, DOER includes biomass "thermal gasification," yet again a completely different technology whereby biomass is heated at low oxygen levels to drive off "syngas" which is then collected, cleaned, and then (in theory) can be used to generate electricity using a combined cycle turbine system, or can be converted into other products similar to natural gas.[76] Biomass gasification works best with relatively dry fuels, and the plants are complex with high parasitic load, meaning that lifecycle GHG impacts associated with this technology may be higher than at typical biomass power plants.

With the exception of syngas collection, the operation of a true gasifier is essentially similar to that of a typical wood-burning plant, especially since the organic material left over after gasification may be burned using a conventional wood-burning unit. Alternatively, this material may be used as "biochar," for which extravagant claims of carbon benefits have been made.

Yet there does not appear to be any *actual* GHG accounting required for the "eligible biogas" category. While the proposed regulation does specify a lifecycle GHG reduction for "Eligible Biogas Fuel, Eligible Biomass Woody Fuel, Eligible Liquid Biofuel or Manufactured Biomass Fuel," there is no mechanism in the carbon calculator for calculating carbon impacts from biogas. *See* Proposed 225 C.M.R. 14.05(1)(a)(7)(d) & (e).

Further, even for non-wood feedstocks, it is not justified to assume a carbon benefit from these technologies absent further scrutiny. Anaerobic digestion, which has typically been assumed to be the collection of methane from decomposition of agricultural and other wastes, is evolving into a technology that can use purpose-grown crops as feedstock, or some kinds of wood. DOER should not be broadly incentivizing this diverse range of technologies with so little information or control over their actual effects, which besides greenhouse gas emissions can include a

[76] It is not clear whether DOER includes in the concept of "thermal gasification" the technology of staged combustion, whereby biomass is combusted at reduced oxygen levels then the gases driven off are immediately burned in the unit, without the intermediate step of collection and cleaning of syngas. Some people refer to this as "gasification," but it is really just typical combustion.

variety of environmental impacts related to land use, waste management, water quality, and others.

Impact: This new category could increase use of wood and other biomass as feedstock and increase GHG emissions.

Recommendation: Either abandon these changes, or rewrite the category requirements for biogas to explain the different technologies involved. Update the carbon calculator to enable it to perform rigorous GHG accounting for biogas. Require biogas and a demonstration that the biogas reduces emissions to less than 50% of natural gas over a ten-year period. Set environmental requirements for each technology to ensure that only the best, most environmentally friendly projects are incentivized. Specify that biomass gasification is required to undergo GHG accounting like conventional combustion, and add in a rigorous lifecycle element to the carbon calculator to ensure that the energy-intensive nature of biomass gasification is properly noted.

V. The Proposal reduces accountability

Reduces transparency and accountability in fuels tracking

Proposed 225 C.M.R. 14.05(8)(d): DOER proposes sweeping changes to the fuel tracking system and the Guideline on Eligible Biomass Fuels that virtually eliminate accountability and responsibility of foresters and harvesters to ensure that biomass harvesting does not harm forests. These are discussed in more detail below in the section on forest protections, but are mentioned here as a serious example of DOER reducing accountability and oversight.

Abolishes citizen advisory panel

Proposed 225 C.M.R. 14.05(8): DOER is eliminating oversight in the form of a 9-person Advisory Panel that was supposed to report on the tracking and enforcement of biomass regulations. To our knowledge, this panel was never convened after the 2012 regulations went into effect.

Recommendation: Retain and institute the panel.

Reduces transparency and citizen oversight of GHG accounting

Proposed 225 C.M.R. 14.05(8): DOER failed to conduct the Forest Impact Assessment they were supposed to do in 2015, according to the current rules. The proposed rules state one will be conducted in 2020, but DOER has deleted the part that discusses using it to "evaluate the appropriateness and accuracy of greenhouse gas accounting from Generation Units," as well as the requirement to make the report publicly available.

Recommendation: Retain the existing language.

Speeds up pace of regulatory changes

Proposed 225 C.M.R. 14.05(1)(a)(7)(b): DOER proposes reducing the time between proposing regulatory changes and having them come into effect from two years to one.

Recommendation: Retain the existing language.

Allows DOER to unilaterally grant exceptions from the regulations

The Guideline on Eligible Biomass Fuel for Renewable Generation Units states, "The Department may permit an exception from any provision of this Guideline for good cause, so long as the exception is consistent with the requirements set out in G.L. c. 25A, § 11F and regulations promulgated thereunder." DOER thus grants to itself the ability to remake the rules at will, which appears to be a new provision, not appearing in previous documents from the 2012 issuance of the rules. This is unacceptable.

Recommendation: Delete this language.

A good change – reduction in duration of probationary status

One positive change that should be implemented as proposed is the enhanced enforcement authority for DOER to revoke Statements of Qualification. *Compare* 225 C.M.R. 14.05(1)(a)(8)(d)(3)(a) (allowing five years of probationary status before revocation of a violator's Statement of Qualification) *with* Proposed 225 C.M.R. 14.05(1)(a)(8)(f) (authorizing DOER to revoke a Statement of Qualification at the end of one compliance year). Overall, however, the proposed changes have the effect of reducing accountability, as discussed above.

VI. The Proposal reduces protections for forests

Eliminates restrictions on the amount of wood that can be removed as biomass

An important but overlooked provision of the 2012 regulations is the prohibition on granting eligibility to biomass that constitutes greater than 25 - 30% of the weight of wood harvested from a logging job. This restriction is specified in the 4-27-2012 version of the Biomass Eligibility and Certificate Guideline. It serves to prevent liquidation of forests for biomass fuel, although as DOER specifies elsewhere, there is nothing to stop intensive harvesting for biomass; it's just that only a portion of the fuel is eligible to generate renewable energy credits.

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%

Figure 4.

DOER now proposes to eliminate this provision and replace it with vague and unenforceable language about "sustainable harvesting," as discussed in Section VI, *infra*. This deletion, combined with DOER's expansion of the categories of fuel designated as residues, elimination of all actual protections for forests and forest soils, elimination of the certificate system, and

the gutting of citizen oversight will permit exactly the kind of intensive harvesting for biomass that the original rules were designed to avoid.

Recommendation: The limit on removals for fuel is an essential and non-negotiable provision that protects forests. The "sustainable harvesting" provisions are nowhere near as protective as requiring foresters and harvesters to sign off that the harvest limit has been respected. . DOER must retain the existing limits on the percent of total harvested wood that can be considered "eligible biomass."

Eliminates forest and soil protections that were adopted in the 2012 rules

When the state commissioned the Manomet study, a particular charge to the authors was to make recommendations concerning forest health. The Study's executive summary stated, "At the stand level, the most significant sustainability concerns associated with increased biomass harvests are maintenance of soil productivity and biodiversity." It advises that state policy should ensure that "1) enough coarse woody debris is left on the ground, particularly at nutrient poor sites, to ensure continued soil productivity and 2) enough standing dead wildlife trees remain to promote biodiversity."[77]

The 2012 version of the regulations accordingly contained specific guidance on biomass harvesting to help maintain soil fertility and other ecosystem values. DOER's initial excel workbook guideline published 4-27-12 contains information (Figure 4) on the amount of residues that must be retained on site, based on soil type, [78] and a detailed list of soil classifications.

Since then, various studies have further documented that forest harvesting, and particularly biomass harvesting, depletes both soil nutrients and soil carbon. Berger et al (2013) reviewed the literature and found extensive evidence that removal of forestry residues can deplete soil levels of calcium, potassium, and magnesium, essential nutrients for forest growth.[79] Achat et al (2015) found that intensive biomass harvests led to losses of soil organic carbon in all layers of forest soils and that "estimated carbon losses from forest soils suggested that intensive biomass harvests could constitute an important source of carbon transfer from forests to the atmosphere, partly neutralizing the role of a carbon sink played by forest soils."[80] Working in New Hampshire, Hamburg et al (2019) found that whole-tree harvest (i.e., removal of residues) caused significant depletion of soil carbon and nitrogen:

"Mineral soil C decreased by 15% (20 Mg ha^{-1}) relative to pre-harvest levels by year 8, with no recovery in soil C stocks by year 15. Proportional changes in N stocks were similar. The loss of mineral soil C offset two-thirds of the C accumulation in aboveground biomass over the same 15

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[77] MANOMET STUDY, supra n.4, at 8.

[78] *See Forest Derived Eligible Biomass Woody Fuel Guideline* (published date Apr. 27, 2012).

[79] Berger, A. L., B. Palik, A. W. D'Amato, S. Fraver, J. B. Bradford, K. Nislow, D. King and R. T. Brooks (2013). "Ecological Impacts of Energy-Wood Harvests: Lessons from Whole-Tree Harvesting and Natural Disturbance." Journal of Forestry 111(2): 139-153.

[80] Achat, D. L., M. Fortin, G. Landmann, B. Ringeval and L. Augusto (2015). "Forest soil carbon is threatened by intensive biomass harvesting." Scientific Reports 5: 15991.

years, leading to near-zero net C accumulation post-harvest, after also accounting for the decomposition of slash and roots. If this result is broadly representative, and the extent of forest harvesting is expanded to meet demand for bioenergy or to manage ecosystem carbon sequestration, ***then it will take substantially longer than previously assumed to offset harvest- or bioenergy-related carbon dioxide emissions with carbon uptake during forest regrowth****."*[81]

Despite DOER's former concern for soil fertility, the agency now proposes to eliminate all the previous rules for biomass harvesting, including the provisions intended to effectuate the Manomet study's soil health and biodiversity recommendations, and replace them with vague, unenforceable language.[82] The proposed guideline does not even mention soil.[83] Instead it recommends that a licensed forester "attest" that the lands harvested "were covered by a cutting plan" and implemented "operational guidelines for biomass retention and harvesting" set out in a Forest Guild publication.[84]

The Forest Guild advice on residues retention is too vague to be useful. For instance, it 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*." [85]

As Massachusetts has many areas of nutrient-poor soils, these general recommendations from 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 itself recommends state-specific guidelines: "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 precisely what the 2012 regulations did—they identified areas where biomass harvesting should not occur.

Even these weak provisions aren't required if forests are certified under certain programs: "At time of writing, these are the Forest Stewardship Council (FSC) and Program for the Endorsement of Forest Certification (PEFC), which includes the Sustainable Forestry Initiative (SFI) and American Tree Farm System (ATFS). The Department will continue benchmarking other independent certification programs and may update this Guideline as necessary."[86]

We have not found any evidence that any of these programs set specific recommendations on retention of forestry residues to maintain soil fertility. These are voluntary standards, with

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[81] Hamburg, S. P., M. A. Vadeboncoeur, C. E. Johnson and J. Sanderman (2019). "Losses of mineral soil carbon largely offset biomass accumulation 15 years after whole-tree harvest in a northern hardwood forest." Biogeochemistry 144(1): 1-14.

[82] *See* Proposed *Guideline on Eligible Biomass Fuel for Renewable Generation Units*.

[83] *See* Proposed *Guideline on Eligible Biomass Fuel for Renewable Generation Units*.

[84] *Id.* at 2.

[85] FOREST GUILD BIOMASS WORKING GRP., FOREST BIOMASS RETENTION AND HARVESTING GUIDELINES FOR THE NORTHEAST 5 (2010), *available at* https://newenglandcottontail.org/sites/default/files/research_documents/Forest%20Biomass%20Retention%20and%20Harvesting%20Guidelines.pdf.

[86] Proposed Guideline on Eligible Biomass Fuel for Renewable Generation Units, at 2.

limited, periodic oversight. They are not a substitute for a specific requirement that requires foresters and harvesters to sign their names to a document that says residues have been retained on site.

DOER has not only gutted the protections for soils, its carbon accounting protocol does not include soil carbon losses from harvesting, which as the credible studies cited above show can be significant.

Recommendation: DOER must strengthen the 2012 forest protection guidelines for the RPS based on updated science and future biosequestration policy goals, not supersede and weaken them. DOER should add soil carbon losses to the carbon accounting protocol for qualifying bioenergy.

Eliminates all other forest protections in the 2012 regulations

Besides the restrictions on residues removals, the 2012 version of the regulations contained a variety of additional protections for forests, including protections for den trees and natural deadwood that are critical for maintaining biodiversity, and a requirement to leave stumps in place (yanking stumps out for biomass fuel is enormously damaging to site ecology and soils):

> Eligible Biomass Fuel removal is **not allowed from old growth forest stands**. Old growth forest are forests that approximate the structure, composition, and functions of native forests prior to European settlement. They vary by forest type, but generally include more large trees, canopy layers, standing snags, native species, and dead organic matter than do young or intensively managed forests.
>
> Eligible Biomass Fuel removal is **not permitted from harvest on steep slopes**. Steep slopes mean land with a gradient of 30 percent or more for a slope distance of 200 feet or more.
>
> In all harvests of Eligible Biomass Fuel, **all naturally Down Woody Material (DWM) must be retained in the forest**. DWM includes the following three size classes of down material commonly found in the forest:
>
> - Fine Woody Material; down wood less than three (3) inches in diameter.
> - Course Woody Material; down wood with a small-end diameter of three (3) inches or greater and a minimum length of three (3) feet.
> - Large Woody Material; down wood greater than twelve (12) inches in diameter
>
> In all harvests of Eligible Biomass Fuel, **forest litter, forest floor, roots and stumps must be retained and protected**.
>
> In all harvests of Eligible Biomass Fuel, **prescribed quantities of live cavity trees, den trees, and other live decaying trees or snags must be retained and protected**. Den Trees mean dead, rough or rotten trees that provide hollows or cavities for wildlife. Snags mean standing dead trees with few branches, or the standing portion of a broken-off tree. **Snags may provide feeding and/or nesting sites for wildlife.** Prescribed quantities of live cavity trees, den trees, and other live decaying trees or snags are as follows:

- Live decaying trees 12-18 inches DBH; minimum of four (4) must be retained/acre
- Live decaying trees >18 inches DBH; minimum of one (1) must be retained/acre
- Snags > 10 inches DBH; minimum of five (5) must be retained/acre, where DBH is Diameter Breast Height or the outside bark diameter at breast height (4.5 feet above the forest floor on the uphill side of the tree).[87]

DOER is proposing to eliminate *all* these specific protections, replacing them with vague and unenforceable language about "sustainable forestry," as discussed below.

Recommendation: Retain and strengthen (in consultation with forest ecologists and wildlife biologists) the forest protections, consistent with current ecological and climate science.

Replaces science-based metrics with unsupported "Sustainable Forestry" provisions

Despite the extensive use of the term "sustainable forestry" in DOER's proposed rewrite of the regulations, there is no scientific consensus on what this term means, nor does any existing Massachusetts law or regulation define the term. DOER's own definition and approach has no quantifiable standards for measuring what is "sustainable" and what is not, no process for monitoring forestry projects to assess the results of their operations, and no system for enforcing standards of "sustainability."

This slack approach has serious consequences for actual forest sustainability, that is, the ability of forests to continue to survive and thrive in the face of ever increasing threats. For instance, the definition of "Forest Derived Residues" under "Eligible Biomass Woody Fuel" in Proposed 225 C.M.R. 14.02(a) requires only a "[S]ilvicultural prescription as administered by a licensed or certified forester as prescribed in the Department's *Guideline on Eligible Biomass Fuel for Renewable Generation Units*." The *Guideline* clarifies that "[t]he definition of Sustainable Forestry Management, which can be found in 225 C.M.R.14.02, is based off the definition of Sustainable Forestry from the Dictionary of Forestry provided by the Society of American Foresters."[88] However, the cited definition entirely lacks quantification or measurable standards.[89] It also dates from 1998, before the looming threats to biodiversity from climate change were fully understood. This definition is a completely inadequate basis for making decisions on forest management that will have an impact on climate change, biological diversity, and other critical values that extend for centuries into the future.

The proposed definition of "Sustainable Forestry Management" is similarly meaningless. *See* Proposed 225 C.M.R. 14.02. There are no quantifiable standards for measuring what is "sustainable" and what is not, no process for monitoring forestry projects to assess the results of their operations, and no system for enforcing standards of "sustainability." It is unclear how this standard could be enforced. Based on this definition, there is no indication of how one

[87] *Biomass Eligibility and Certificate Guideline*, 4-27-2012 version (emphasis added).
[88] Proposed *Guideline on Eligible Biomass Fuel for Renewable Generation Units,* at 1.
[89] *See Sustainable Forest Management*, THE DICTIONARY OF FORESTRY (John A. Helms ed., 1998) ("Sustainable forest management (sustainable forestry) (SFM)—this evolving concept has several definition . . . [listing menu of abstract concepts].").

would review a logging plan, inspect the site of a proposed logging project, or assess the outcome of a logging job and determine whether it meets the definition of "Sustainable Forestry Management."

For example, "conservation of biological diversity" is a generic term. There is no guidance for the level of detail at which a forester must inventory the site before and after logging. This could mean a complete inventory of all plants and animals on the site before any logging is planned or done, and another such inventory when it is done. Or it could simply mean that a forester eyeballs the site before and after.

Further, it is impossible to judge what "maintenance of forest contributions to global carbon cycles" or "maintenance of productive capacity of forest ecosystems" mean. It could mean maintaining the rate and amount of carbon sequestration by the forest, or it could mean there should be no reduction in carbon storage from pre-logging levels. It could mean maximizing timber production, or maintaining fully functioning natural forest ecosystems.

In Proposed 225 C.M.R. 14.05 (8)(a) the eligibility criterion for "sustainable forest management" specifies that, "Forest Derived Residues and Forest Derived Thinnings shall only be sourced from forests meeting Sustainable Forestry Management practices, as independently verified through the attestation of a licensed forester, certified forester or independent certification." However, as noted above, there is no scientifically agreed-upon definition for "sustainable forest management" to guide a forester in making a determination of eligibility. This is true of independent certifying entities, such as the Forest Stewardship Council and Sustainable Forestry Initiative, which have standards that are quite divergent. Moreover, the FSC and especially the SFI, which was created and is administered by the forest products industry, have been widely criticized by forest conservationists.[90]

Finally, no sustainability standards apply to "Forest Salvage," a category that DOER proposes to significantly expand and which impacts forests already burdened by disease or pest infestation. The draft guideline on eligible fuel states, "Non-Forest Derived Residues and Forest Salvage (as defined in 225 CMR 14.02) are considered to meet the sustainability requirements, so for these resources, no further sustainability demonstration is required."[91]

This is not acceptable. By definition, "salvage" situations may represent forests that are even more fragile and require even more care taken during harvesting. Further, given recent pest infestations – particularly the gypsy moth caterpillar outbreak of the last two years, which targets oaks first, but also impacts other trees – it is important to ensure that subsidies for biomass harvesting do not incentivize harvesting trees for fuel that could be used for other purposes. If DOER believes there is a problem to be solved in this area, it should elevate the issue to the Secretary of Energy and Environmental Affairs to assign the appropriate agency to

[90] *See, e.g.*, Richard Conniff, *Greenwashed Timber: How Sustainable Forest Certification Has Failed*, YALE ENVIRONMENT 360 (Feb. 20, 2018), https://e360.yale.edu/features/greenwashed-timber-how-sustainable-forest-certification-has-failed; Sierra Club, *Environmental Leaders Critique SFI* (date not specified), https://content.sierraclub.org/ourwildamerica/sites/content.sierraclub.org.ourwildamerica/files/Environmental%20Leaders%20Condemn%20SFI.pdf.

[91] Draft Guideline on Eligible Biomass Fuel for Renewable Generation Units, undated.

develop an incentive system to ensure that timber-quality material is recovered, stockpiled, and metered out in a way that does not flood the market. A system to do this was set up after the 1938 hurricane,[92] when immeasurably more wood was liquidated; a similar system should be put in place now.

Recommendation: Retain and strengthen existing guidelines for biomass harvesting, including strengthening residue retention levels to help protect soils against erosion and to maintain site carbon, nutrient, and habitat status. Work with forest ecologists and the Massachusetts environmental community to set guidelines that protect and strengthen forests in the face of increasing threats.

Eliminates accountability from the fuel tracking and certificate system

Along with eliminating forest protection measures, DOER's proposed changes eliminate almost all fuel tracking requirements.

The current fuel certificate and tracking system provide accountability and oversight both because the forest and soils protections are specific and clear, and because the forester and harvester have to sign their names to attest to the standards being met. The current guideline consists of an excel workbook that combines guidance on soil and forest protections with actual fuel certificates that record the name of the forester and the harvester.

In the current certificate, the harvester is required to sign the following: "*I certify that the Biomass Fuel accompanied by this Certificate removed from the harvest site identified in the Forest/Harvest Information above was done according to the requirements and limitations pertaining to Biomass Woody Fuels under 225 CMR 14.00, as prescribed to me by the responsible licensed Forester in the Biomass Tonnage Report and the USDA NRCS Soil Survey Map applicable to the harvest site*." Specific and precise language in the regulation itself (starting at 225 CMR 14.05(8)(a)(2)) makes compliance with these procedures mandatory – language that DOER now proposes to delete.

In fact, DOER proposes to eliminate the entire fuel tracking procedure, including the workbook containing the guidance, fuel certificates, and signatures. All of the provisions that protect forests are eliminated in favor of a vague and unenforceable call for "sustainable forest management". As a replacement for specific guidelines, DOER proposes to accept a "Licensed Forester Attestation" as evidence of sustainable harvesting, whereby the forester attests that "all the lands from where Eligible Biomass Woody Fuel was sourced were covered by a cutting plan that adhered to best management practices," and that the harvest implemented guidelines for residue retention from the Forest Guild. However, it does not require any detail as to the relevant best management practices, and there is no place in the document for this attestation to occur. Whereas the 2012 guideline is an excel workbook that provides all the materials a forester would need to execute every step of the certification process, including the fuel certificates themselves that accompany each load of biomass, the proposed draft guideline

[92] *See* Stephen Long, "Thirty-Eight: Salvaging Lumber in the Wake of New England's Most Damaging Storm." Northern Woodlands Magazine, Summer 2016. At https://northernwoodlands.org/articles/article/thirty-eight-new-england-lumber-storm.

is simply a pdf document describing procedures and does not require execution. The proposed replacement attestation is unenforceable and meaningless.

For fuel harvested outside of Massachusetts, DOER allows third-party certification programs as evidence that sustainability requirements have been met. However, again, there are no instructions or means for delivering the proof of certification.

The regulation retains language requiring facilities to demonstrate ownership of biomass fuel certificates to demonstrate that only eligible fuel was used (225 CMR 14.05(8)(e)), but the certificates themselves do not appear to exist anymore. DOER has eliminated the excel workbook guideline document that contained the certificates and preparatory material without a replacement.

Recommendation: Retain the existing framework of forest and soil protections, fuel certificates, and accountability.

Conclusion

The undersigned groups urge DOER to withdraw the changes proposed to biomass eligibility in 225 C.M.R. 14.00 and 225 C.M.R. 15.00. Any further reform of these regulations should only take place in the context of the updated Clean Energy and Climate Plan for 2030, following a stakeholder process, in light of the Commonwealth's near-term need to reduce greenhouse gas emissions and long-term biosequestration needs to meet the 2050 GWSA requirement.

Signed,

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Appendix: Methane emissions from wood chip piles and wood pellets

Below are abstracts from scientific papers discussing methane emissions from stockpiles of wood chips and wood pellets used for biomass fuel.

Esa Alakoski et al., *From Wood Pellets to Wood Chips, Risks of Degradation and Emissions from the Storage of Woody Biomass – A Short Review*, 54 RENEWABLE & SUSTAINABLE ENERGY REV. 376 (2016):

> The compounds in stored woody biomass degrade as a result of chemical and/or biological processes during storage. These processes produce gaseous emissions. Recent studies concerning gaseous emissions from wood pellet storages are reviewed herein. The applicability of the results from pellet research to wood chips is discussed. Thorough scientific understanding on the storage phenomena of wood chips is extremely important as the threat of climate change and the need to reduce greenhouse gas emissions have led to an increased need to large scale wood chip storage to ensure supply. Typically the gases produced from stored woody biomasses are carbon monoxide (CO), carbon dioxide (CO2), methane (CH4), and other volatile hydrocarbons e.g. aldehydes and terpenes. CO2 and CH4 are greenhouse gases with high global warming potential. Chemical degradation via auto-oxidation of fats and fatty-acids seems to be the dominant mechanism for off-gassing from stored wood pellets, whereas biological processes are mainly responsible for the gaseous emission from wood chips. In confined storage spaces gaseous emissions may lead to oxygen depletion. Oxygen depletion together with a high CO concentration poses a serious health risk for those working in such conditions. The degradation processes also result in dry matter losses and in spontaneous heating and in the worst case, especially in large piles, spontaneous ignition of the stored material. Thorough and systematic scientific studies on degradation processes and their effects are needed in order to understand and minimise risks from large scale wood chips storage to human health, environment and property.

BTG BIOMASS TECH. GRP. BV, METHANE AND NITROUS OXIDE EMISSIONS FROM BIOMASS WASTE STOCKPILES (PCFplus Research Report No. 12, 2002):

> Highest emissions are from freshest biomass. Large wood residue stockpiles may represent a potential source of the greenhouse gases nitrous oxide (N2O), and - if anaerobic digestion occurs inside the stockpiles - methane (CH4). If these gases are indeed emitted, a project which would mitigate the generation and stockpiling of wood residues could be allowed to claim greenhouse gas emission reductions. At present not much is known about the extent of methane and nitrous oxide emissions from wood stockpiles. Therefore an assignment has been commissioned by The World Bank (PCFplus research) to build a general methodology for assessing methane and nitrous oxide emissions from wood residue stockpiles, and using it for assessing the likelihood of estimated methane

emissions in one such project in Bulgaria. The assignment consists of a literature survey on methane and nitrous oxide emissions from wood stockpiles, followed by field methane emission measurements on wood stockpiles in Bulgaria, and the development of a spreadsheet model for predicting future methane emissions. Literature survey As expected only a few articles about methane emissions from wood residue stockpiles were found. Therefore also literature on methane emissions from landfills was included in the survey, of which a large number of publications exists. Methane emissions from landfills show a large temporal and spatial variability, implying that methane emissions at different spots on one landfill can vary up to a factor 1000, and that emissions can vary significantly dependent on the time of day, the season, barometric pressure and precipitation. Seasonal variation is caused by biological oxidation of methane in the top layer of a landfill, and is more pronounced at higher ambient temperatures. It is expected that the same mechanisms and variations in methane emissions from landfills will also take place in wood stockpiles.

Mirjam Röder et al., *How Certain Are Greenhouse Gas Reductions from Bioenergy? Life Cycle Assessment and Uncertainty Analysis of Wood Pellet-to-Electricity Supply Chains from Forest Residues*, 79 BIOMASS & BIOENERGY 50 (2015):

Climate change and energy policies often encourage bioenergy as a sustainable greenhouse gas (GHG) reduction option. Recent research has raised concerns about the climate change impacts of bioenergy as heterogeneous pathways of producing and converting biomass, indirect impacts, uncertainties within the bioenergy supply chains and evaluation methods generate large variation in emission profiles. This research examines the combustion of wood pellets from forest residues to generate electricity and considers uncertainties related to GHG emissions arising at different points within the supply chain. Different supply chain pathways were investigated by using life cycle assessment (LCA) to analyse the emissions and sensitivity analysis was used to identify the most significant factors influencing the overall GHG balance. The calculations showed in the best case results in GHG reductions of 83% compared to coal-fired electricity generation. When parameters such as different drying fuels, storage emission, dry matter losses and feedstock market changes were included the bioenergy emission profiles showed strong variation with up to 73% higher GHG emissions compared to coal. The impact of methane emissions during storage has shown to be particularly significant regarding uncertainty and increases in emissions. Investigation and management of losses and emissions during storage is therefore key to ensuring significant GHG reductions from biomass.

Urban Svedberg et al., *Hazardous Off-Gassing of Carbon Monoxide and Oxygen Depletion during Ocean Transportation of Wood Pellets*, 52 ANNALS OF OCCUPATIONAL HYGIENE 259 (2008):

Five ocean vessels were investigated for the characterization and quantification of gaseous compounds emitted during ocean transportation of wood pellets in closed cargo hatches from Canada to Sweden. The study was initiated after a

> fatal accident with several injured during discharge in Sweden. The objective with the investigation was to better understand the off-gassing and issues related to workers' exposure. Air sampling was done during transport and immediately before discharge in the undisturbed headspace air above the wood pellets and in the staircase adjacent to each hatch. The samples were analyzed with Fourier transform infrared spectroscopy and direct reading instruments. The following compounds and ranges were detected in samples from the five ships: carbon monoxide (CO) 1460–14650 ppm, carbon dioxide (CO(2)) 2960–21570 ppm, methane 79.9–956 ppm, butane equivalents 63–842 ppm, ethylene 2–21.2 ppm, propylene 5.3–36 ppm, ethane 0–25 ppm and aldehydes 2.3–35 ppm. The oxygen levels were between 0.8 and 16.9%. The concentrations in the staircases were almost as high as in the cargo hatches, indicating a fairly free passage of air between the two spaces. A potentially dangerous atmosphere was reached within a week from loading. The conclusions are that ocean transportation of wood pellets in confined spaces may produce an oxygen deficient atmosphere and lethal levels of CO which may leak into adjacent access spaces. The dangerous combination of extremely high levels of CO and reduced oxygen produces a fast-acting toxic combination. Measurement of CO in combination with oxygen is essential prior to entry in spaces having air communication with cargo hatches of wood pellets. Forced ventilation of staircases prior to entry is necessary. Redesign, locking and labeling of access doors and the establishment of rigorous entry procedures and training of onboard crew as well as personnel boarding ocean vessels are also important.

Carly Whittaker et al., *Dry Matter Losses and Methane Emissions during Wood Chip Storage: The Impact on Full Life Cycle Greenhouse Gas Savings of Short Rotation Coppice Willow for Heat*, 9 BIOENERGY RES. 820 (2016):

> A life cycle assessment (LCA) approach was used to examine the greenhouse gas (GHG) emissions and energy balance of short rotation coppice (SRC) willow for heat production. The modelled supply chain includes cutting multiplication, site establishment, maintenance, harvesting, storage, transport and combustion. The relative impacts of dry matter losses and methane emissions from chip storage were examined from a LCA perspective, comparing the GHG emissions from the SRC supply chain with those of natural gas for heat generation. The results show that SRC generally provides very high GHG emission savings of over 90 %. The LCA model estimates that a 1, 10 and 20 % loss of dry matter during storage causes a 1, 6 and 11 % increase in GHG emissions per MWh. The GHG emission results are extremely sensitive to emissions of methane from the wood chip stack: If 1 % of the carbon within the stack undergoes anaerobic decomposition to methane, then the GHG emissions per MWh are tripled. There are some uncertainties in the LCA results, regarding the true formation of methane in wood chip stacks, non-CO2 emissions from combustion, N2O emissions from leaf fall and the extent of carbon sequestered under the crop, and these all

contribute a large proportion of the life cycle GHG emissions from cultivation of the crop.

Margareta Wihersaari, *Evaluation of Greenhouse Gas Emission Risks from Storage of Wood Residue*, 28 BIOMASS & BIOENERGY 444 (2005):

> The use of renewable energy sources instead of fossil fuels is one of the most important means of limiting greenhouse gas emissions in the near future. In Finland, wood energy is considered to be a very important potential energy source in this sense. There might, however, still be some elements of uncertainty when evaluating biofuel production chains. By combining data from a stack of composting biodegradable materials and forest residue storage research there was an indication that rather great amounts of greenhouse gases maybe released during storage of wood chip, especially if there is rapid decomposition. Unfortunately, there have not been many evaluations of greenhouse gas emissions of biomass handling and storage heaps. The greenhouse gas emissions are probably methane, when the temperature in the fuel stack is above the ambient temperature, and nitrous oxide, when the temperature is falling and the decaying process is slowing down. Nowadays it is still rather unusual to store logging residue as chips, because the production is small, but in Finland storage of bark and other by-products from the forest industry is a normal process. The evaluations made indicate that greenhouse gas emissions from storage can, in some cases, be much greater than emissions from the rest of the biofuel production and transportation chain.