Comments Received: Clean Heat Standard

May 2023

Table of Contents

May 1, 2023

Massachusetts Department of Environmental Protection
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: A Better City's Comments on the Massachusetts Clean Heat Standard Discussion Document and Heating Fuel Supplier Discussion Draft Regulations

Dear Commissioner Heiple:

On behalf of A Better City's nearly 130-member business organizations, thank you for the opportunity to provide comments on the Clean Heat Standard (CHS) Discussion Document and Heating Fuel Supplier Discussion Draft Regulations. A Better City appreciates the Healey Administration's commitment to ensure that Massachusetts meets or exceeds its ambitious climate goals.

Our comments on the development of a proposed CHS regulation and related heating fuel supplier reporting requirements include: 1) clarifying the definition of heating fuel suppliers; 2) suggesting how the standard could be expressed; 3) accommodating clean heat deployed prior to the CHS taking effect; 4) including weatherization as clean energy for credit generation; 5) considering Combined Heat and Power (CHP) as a transitional clean energy for credit generation; 6) opposing the CHS being supported by a declining cap on emissions at this time; and 7) ensuring that implementation of the CHS will not exacerbate customer energy burdens.

1) Clarifying the Definition of Heating Fuel Suppliers

The Clean Heat Standard discussion document describes heating fuel suppliers as suppliers of energy to building heating systems, including utilities, wholesale liquid fuel and propane suppliers, and retailers as necessary to ensure all fuel delivered to Massachusetts is covered under the standard. There is no mention in this definition of building owners.

The Heating Fuel Supplier Draft Regulations, however, describes heating fuel suppliers as any person that on or after January 1, 2023, is (or was) an owner of heating fuel at the time such fuel is (or was) delivered for consumption as heating fuel in Massachusetts. Heating fuel suppliers include natural gas utilities, suppliers of propane and liquid distillate heating fuel, and any building owner or other entity that is an owner of heating fuel at the time such fuel is delivered for consumption as heating fuel in Massachusetts.

As many A Better City members are building owners, it is important to understand if they are included as heating fuel suppliers and if so, under what circumstances.

Recommendation: A Better City recommends clarifying the definition of heating fuel suppliers, particularly as it pertains to building owners.

2) Suggesting How the Standard Could be Expressed

The discussion document asks whether the CHS should be expressed in terms of GHG emissions reductions, clean heating energy supplied, or something else such as square feet of conditioned space converted to clean heat. As the Clean Energy and Climate Plan sets clear GHG emissions reduction limits for the buildings sector stated as a 28% reduction from a 1990 baseline by 2025 and 47% by 2030, measured in million metric tons of CO_2 equivalent, we suggest using these measures to express the standard. Moreover, the Commonwealth's statutory climate commitments established in the 2021 climate bill set clear and legally binding economy-wide and sector-specific targets for greenhouse gas emissions reductions in five-year increments from 2025 through 2050. Expressing the Clean Heat Standard through GHG emissions would help to promote alignment and coordination with established climate and clean energy policies in Massachusetts, as well as alignment with greenhouse gas-based municipal policies like the Building Emissions Reduction and Disclosure Ordinance (BERDO 2.0) in Boston.

Recommendation: A Better City recommends using greenhouse gas (GHG) emissions to express the CHS measured in millions of metric tons of CO2 equivalent as consistent with the Commonwealth's Clean Energy & Climate Plan and 2021 Climate Bill.

3) Accommodating Clean Heat Deployed Prior to the CHS Taking Effect

As with different policies that recognize work done prior to the policy taking effect, we suggest establishing a flexible baseline that could include work done up to a certain number of years prior to the CHS taking effect. Boston's Building Emissions Reduction and Disclosure Ordinance (BERDO 2.0), for example, allows an earlier baseline if data exists that can be third party verified. Similarly, the baseline could include the type of clean heat deployed prior to the CHS taking effect. For example, clean fuels deployed prior to the CHS taking effect may be something that could be accommodated but already operating heat pumps may not. The number of years clean heat has been deployed prior to the CHS taking effect and the type of clean work previously done are decisions that need to be made to establish a flexible baseline.

Recommendation: A Better City recommends establishing a flexible baseline to recognize clean heat deployed prior to the CHS taking effect.

4) Including Weatherization as Clean Energy for Credit Generation

We strongly support weatherization being included as clean energy for credit generation. It is essential for buildings to be weatherized before electrification so that the increase in electricity demand does not become unmanageable for the grid and paying customers. We also understand that the Clean Heat Commission spent a considerable amount of time discussing the importance of weatherization.

Recommendation: A Better City strongly supports weatherization being included as clean energy for credit generation.

5) Considering Combined Heat and Power (CHP) as Clean Energy for Credit Generation
CHP may be considered as clean energy for credit generation depending on the administration's interpretation of credit generation. If CHP can deliver lower emissions, then it could be considered as clean energy for credit generation. If credit generation requires net reduction of lifetime emissions, it may not be considered. That final determination will be at the discretion of the Administration. We are requesting the Administration consider CHP as a transitional clean energy for credit generation.

Recommendation: A Better City recommends considering CHP as a transitional clean energy for credit generation.

6) Opposing the CHS Being Supported by a Declining Cap on Emissions
It is important to understand how existing programs like the Alternative Portfolio Standard (APS) and Renewable Portfolio Standard (RPS) will interact with the CHS, *before* introducing a declining cap on emissions like a cap and invest program for the heating sector. We therefore do not support introducing a declining cap on emissions at this point.

Recommendation: Until more clarity is provided regarding how the Clean Heat Standard will interact with existing programs like the Alternative Portfolio Standard (APS) and Renewable Portfolio Standard (RPS), A Better City does not support instituting a declining cap on emissions/cap and invest program for the heating sector.

7) Ensuring that Implementation of the CHS will not Exacerbate Customer Energy Burdens
We recommend more attention be given to the implementation of the CHS and how it may result in increased energy costs for customers. As clean heat providers must create or own clean heat credits to comply with the CHS, we are concerned that the additional cost of compliance may be passed down to ratepayers, further exacerbating energy burdens on those least able to pay.

Recommendation: A Better City recommends clarifying compliance with the Clean Heat Standard such that it doesn't result increased energy burden in low- and moderate-income households.

We thank you for your leadership and remain committed to working with you throughout the development of the Clean Heat Standard and ensuring an effective and equitable transition to a decarbonized economy. Please reach out to Yve Torrie (ytorrie@abettercity.org) with any comments and questions.

Sincerely,

Y. L. Torrie

Yve Torrie
Director of Climate, Energy & Resilience

ALVIN HOLLIS

COMMITTED TO YOUR HOME COMFORT

FUEL OIL • HEATING • PLUMBING • AIR CONDITIONING

1 Hollis Street, South Weymouth, MA 02190
781-335-2100 • 1-800-649-5090
Fax: 781-335-6134
www.alvinhollis.com

April 27, 2023

Dear Sir/Madam,

My name is Laura Carbone and I am owner of Alvin Hollis & Company, Inc., a 5 generation-family owned energy business that has been taking care of the needs of our neighbors on the South Shore since 1871. We have over 6,000 customers that rely on us for all of their plumbing, heating and air conditioning needs 24 hours a day, 7 days a week. Many of my employees are second generation employees, following in the footsteps of their fathers and mothers, making this a true Alvin Hollis family. For over 152 years, Alvin Hollis has also been a fixture in the community by donating our time and money to important causes including South Shore Hospital, Dana Farber Cancer Institute, Old South Union Church, innumerable Little League Teams, local town fundraisers and hundreds of non-profits.

Alvin Hollis is committed to actively reducing carbon emissions by offering Bioheat, a liquid fuel that has been scientifically proven to reduce greenhouse gas emissions. We voluntarily started offering Bioheat to our customers starting back in 2007, 16 years ago! This was before the 2008 Clean Fuels Bioheat Act was even implemented!

The Massachusetts Department of Environmental Protection (DEP) has started a regulatory process to enact a Clean Heat Standard (CHS) which is nothing more than an escalating tax on fossil fuels that is designed to favor electrification of ALL homes and businesses with electric heat pumps. In addition, there is a mandate that all heating oil and propane retailers convert 3% of their customer base annually to these heat pumps.

I believe the purpose of our elected officials is to protect their constituents. They should NOT be in the business of picking winners and losers. By implementing a significant tax on fossil fuels, the DEP is certainly forcing the playing field to become uneven in favor of electric heat pumps. In addition, the DEP does not understand nor do they care how our business model works. Who would ever mandate a REDUCTION in a small business customer base? This is government overreach at the highest level.

Please help us to stop the regulatory process of the CHS and let the consumer choose what energy is best for their home. Our 152 year-old family owned business hangs in the balance.

Sincerely,

Laura

Laura Bicknell Carbone
Alvin Hollis & Co., Inc.
www.alvinhollis.com

AMERESCO
Green • Clean • Sustainable

111 Speen St, Stc 410
Framingham, MA 01701

P: 508 661 2200
F: 508 661 2201

ameresco.com

May 1, 2023

Massachusetts Department of Environmental Protection
100 Cambridge Street Suite 900
Boston, Massachusetts 02114

Re: Clean Heat Standard Program Design

Ameresco, Inc. submits this comment in response to the Massachusetts Department of Environmental Protection's ("MassDEP") March 2023 Stakeholder Discussion Document for the Clean Heat Standard Program Design ("Discussion Document"). It is critical that Massachusetts adopts a technology-agnostic Clean Heat Standard that credits greenhouse gas emissions reductions for heating in the building sector to the greatest extent possible in the immediate- and long-term. This includes crediting Renewable Natural Gas ("RNG") given its significant lifecycle GHG emissions reductions compared to fossil fuel heating sources and its abundance and availability as a near-term solution to reducing GHG emissions. RNG can serve both as a direct energy source for heating homes, and as a low-carbon fuel source for electricity generation that powers home heating systems. In either case, RNG can greatly reduce the GHG impact of home heating, especially as all-electric heating systems are deployed and other renewable electricity sources such as wind and solar expand their market share. MassDEP should consider Ameresco's recommendations below when developing a Clean Heat Standard.

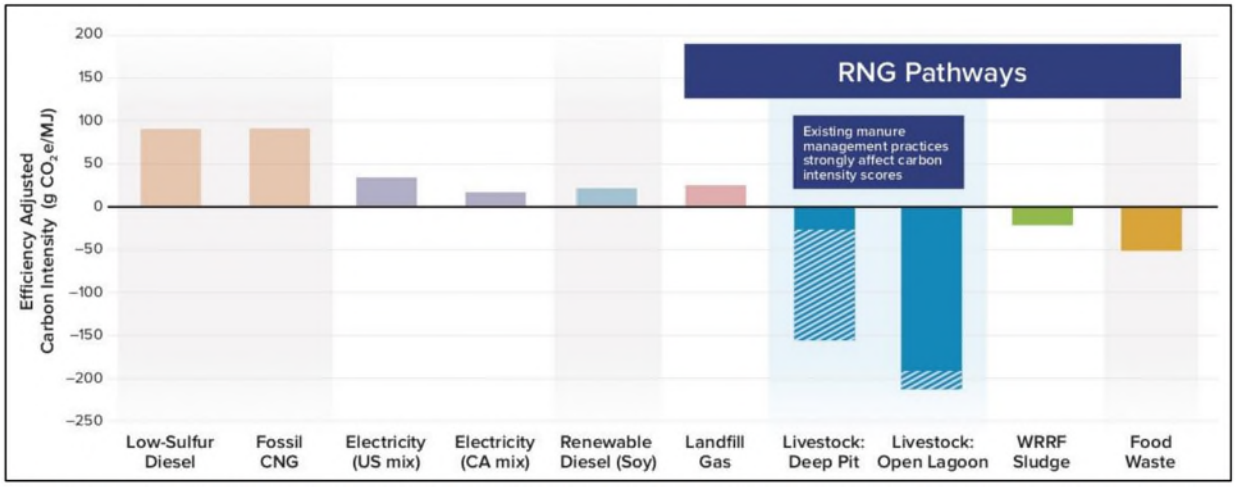
About Ameresco

Ameresco is a leading renewable energy developer, owner, and operator that focuses on renewable energy supply, energy efficiency, infrastructure upgrades, asset sustainability, and other renewable energy solutions for clients across North America and Europe. Ameresco invests in and develops new, clean energy resources and technologies, including solar, wind, battery storage, geothermal, and microgrids. Ameresco also designs, builds, owns, and operates plants that convert primarily landfill or wastewater treatment biogas to RNG and renewable electricity. One of Ameresco's landfill gas-to-energy facilities (with a nameplate capacity of 7.6 MW) is located in Chicopee, Massachusetts and generates renewable electricity for the regional grid. Ameresco is proud that in 2022 its renewable energy assets and customer projects delivered carbon reductions equivalent to 14.7 million metric tons ("MMTs") of CO_2.

MassDEP Should Adopt a Clean Heat Standard That Credits RNG

RNG significantly reduces lifecycle GHG emissions relative to fossil fuels. It can replace natural gas in existing heating systems. It can also be used to generate renewable electricity. RNG thus is readily available to begin reducing building-sector carbon emissions in the near-term. Any Clean Heat Standard proposed by MassDEP must credit RNG as a key clean heating solution.

RNG is derived from biogas from various biogenic sources, including landfills, agricultural waste, and waste biomass processed in anaerobic digesters. RNG consists primarily of biogenic methane. If biogas is not captured and used to produce RNG, that methane either escapes directly into the atmosphere or is flared, producing CO_2 emissions, and inefficiently wasting the resulting energy without displacing fossil fuel use. RNG's carbon intensity varies depending on its source, but as shown below, RNG from any source has a much lower carbon intensity than fossil fuel.



Some RNG pathways have very low carbon intensity (CI) scores because they capture emissions that would otherwise be released to the atmosphere. For farms with manure lagoons that currently emit high levels of methane, RNG production can yield negative CI scores. The diagonal-line overlays on bars represent the *range* of carbon intensity scores that can be achieved with corresponding RNG projects. (CA = California; CNG = compressed natural gas; CO_2e = carbon dioxide equivalent; g = gram; MJ = megajoule; RD = renewable diesel; WRRF = water resource recovery facility.) (ANL GREET)

The above chart from Argonne National Laboratory compares RNG pathways to fossil sources for transportation fuel, rather than heating.[1] Yet it illustrates an important point. RNG has a far lower carbon intensity—and, in some cases, a net-negative carbon intensity—compared to fuels derived from petroleum and fossil natural gas, and competitive or lower carbon intensity as compared to electricity.

RNG is also abundant. Only a fraction of existing biogas is captured, converted to RNG, and used for energy. The capacity of RNG projects under construction in 2022 alone amounted

[1] Argonne National Laboratory, Renewable Natural Gas (RNG) for Transportation, Frequently Asked Questions, at 2 (Mar. 2021), *available at* https://www.anl.gov/sites/www/files/2021-03/RNG_FAQ_March_2021_FINAL_0.pdf.

to 28 percent of existing RNG capacity, reflecting rapid growth in the industry.[2] Any Clean Heat Standard should encourage further growth to avoid allowing energy content from biogas from going to waste.

RNG is also a cleaner alternative to natural gas. RNG contains zero to very low levels of many harmful constituents found in fossil natural gas, such as ethane, propane, butane, pentane, or other trace hydrocarbons.[3] Using RNG instead of fossil natural gas could improve air quality, including in environmental justice communities.

Utilities across the country are reducing carbon emissions using RNG tracked via book-and-claim accounting. This accounting methodology separates the renewable aspect of the RNG from the methane itself, which facilitates transport of RNG via common carrier while fossil methane remains in the marketplace. It is essential that the Clean Heat Standard recognize the benefits of RNG while allowing users to track its renewable attributes via book-and-claim, even when the RNG is produced out of state.

Further, it is important that MassDEP recognizes the full benefits of RNG as both a potential heat source for electricity generation and for heating homes directly. As buildings transition to electric heating systems, those systems will largely draw on baseload and dispatchable resources, which are predominantly powered by fossil fuels. Rewarding the substitution of these fossil fuels with RNG will empower decarbonization of the electricity supply. Further, recognizing the low carbon intensity of RNG as a direct source of energy for home heating will reduce carbon emissions as the electricity grid transitions to being fully renewable.

As with climate change generally, there is no one-size-fits-all solution. RNG must be credited in any Clean Heat Standard, along with other emissions-reduction technologies. In fact, RNG can complement solutions such as heat pumps, decarbonizing homes while Massachusetts undertakes the formidable task of electrifying the building sector. Any Clean Heat Standard must credit a broad suit of solutions such as RNG to be fully effective, as long as they reduce the carbon intensity of energy used to heat buildings.

Topic 1 – Setting the Standard

Ameresco supports a standard that is as aggressive as feasible, so long as it is technology-neutral and appropriately credits non-electrification solutions, such as RNG. If MassDEP determines that more than 1 million metric tons of emissions reductions per year is feasible when more prominently factoring in other clean fuel sources, MassDEP should adopt that higher standard.

[2] Coalition for Renewable Natural Gas, Comment Letter on Renewable Fuel Standard (RFS) Program: Standards for 2023-2025 and Other Changes, Proposed Rule, 87 Fed. Reg. 80582, at 7, Docket ID No. EPA-HQ-OAR-2021-0427 (Feb. 10, 2023) ("RNG Coalition RFS Comment Letter"), *available at* https://www.regulations.gov/comment/EPA-HQ-OAR-2021-0427-0756.

[3] *Id.*, Exh. D (Renewable Natural Gas Supply and Demand for Transportation), at 33.

MassDEP asks how the standard should be expressed—"in terms of GHG emissions reductions, clean heating energy supplied, or something else such as square feet of conditioned space converted to clean heat[.]"[4] Ameresco strongly believes that the standard should be expressed in the same manner as standard life cycle assessments for fuels, in terms of the quantity of CO_2-equivalent greenhouse gases emitted per unit of energy contained in the fuel (g CO_2e per MJ). Adopting such a standard would align with how carbon intensity models evaluate fuels, and how programs such as the California Low Carbon Fuel Standard are administered. Expressing the standard in terms of square feet of conditioned space would simply add an unnecessary step to the process of assessing compliance. In order to differentiate the GHG reductions of different fuel types, carbon intensity values would still be have to be assigned to fuels, then entities would have to estimate fuel use per square foot in order to come up with a square footage metric. This final step is inefficient and unnecessary compared with just regulating carbon intensity directly.

MassDEP also asks whether a "carve out approach" is the "best way to ensure progress to electrification,"[5] and for a different yet related topic, whether it is "necessary to develop emission factors for electricity, or can electricity be counted as a zero-emissions energy supply for crediting purposes?"[6] The Clean Heat Standard should not carve out electricity. An electricity carve-out would gut incentives for decarbonization in the very industry that MassDEP hopes will eventually supply all building energy. Keeping electricity in the program will allow green electricity providers to be rewarded for lower carbon electricity. It will also encourage the use of RNG in markets where electricity is still produced by fossil fuels, rather than putting in greater demand on fossil fuel electricity generation.

In order to incorporate electricity in the program, MassDEP should develop emissions factors for electricity that vary with the electricity sources. Most electricity in the ISO-NE system today is fossil-generated, and such emissions factors will encourage electric generation transition to renewable energy.

MassDEP also asks whether the Clean Heat Standard should be supported by a separate "cap-and-invest" program for the building sector.[7] Ameresco believes that having both a Clean Heat Standard and a cap-and-invest program would be inefficient. Both programs would regulate the exact same environmental attribute—GHG emissions associated with energy used to heat buildings. But the two overlapping programs would double compliance burdens on energy providers, and create potentially inconsistent incentives and obligations, without any commensurate environmental benefit. In reality, the more stringent of the two programs will control energy provider behavior, rendering the other program simply a set of administrative burdens without substantive impact. Only the Clean Heat Standard is necessary.

---

[4] MassDEP, Stakeholder Discussion Document for the Clean Heat Standard Program Design ("Discussion Document"), at 5 (Mar. 2023), *available at* https://www.mass.gov/doc/clean-heat-standard-discussion-document/download.

[5] *Id.* at 5.

[6] *Id.* at 7.

[7] *Id.* at 5.

Topic 2 – Regulated Heating Energy Suppliers

Ameresco supports MassDEP's proposal to designate fossil heating fuel suppliers as the obligated parties under any Clean Heat Standard. Suppliers of renewable sources should generate credits, but they should not themselves be assigned a compliance obligation. This puts the compliance burden where it should be—on the entities supplying fossil fuels—and minimizes the burden on clean fuels suppliers, incentivizing their participation.

Electric energy suppliers should not be exempt from compliance. As discussed above, many electricity sources are fossil fuel-based, and it is essential that the transition to electric heating systems be accompanied by decarbonization of the electricity generation. To the extent electricity is used for home heating purposes, it should be subject to the same compliance burdens as other fuels.

Topic 3 – Credit Generation

MassDEP should propose a credit generation system that is technology-neutral and focused first and foremost on reducing lifecycle GHG emissions relative to fossil fuels. MassDEP need not pick winners and losers among technologies. Setting an aggressive compliance curve and allowing market solutions to compete as compliance alternatives is the best way to foster innovation in the marketplace while achieving requisite reductions in greenhouse gases.

MassDEP identifies several technologies that should be "creditable."[8] MassDEP should not propose a fixed list. The Clean Heat Standard should allow any technology to be creditable if it is shown to reduce lifecycle emissions relative to fossil fuels, so long as MassDEP allows for a carbon intensity value to be assigned to the fuel.

When assessing lifecycle emissions reductions of low-carbon fuels, MassDEP should rely on Argonne National Laboratory's Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies Model ("GREET"). GREET is a widely accepted and sophisticated model. As EPA noted in a recent rulemaking proposal, "GREET includes more than 100 fuel production pathways including fuels used in road, air, rail, and marine transportation. It also examines more than 80 on-road vehicle/fuel systems for both light and heavy-duty vehicles. The model reports lifecycle energy use, air pollutants, GHGs and water consumption. It includes detailed representations of the petroleum, electric, natural gas, hydrogen, and renewable energy sectors."[9] The Argonne GREET model is also updated annually, unlike other, state-specific derivative models, such as California's GREET Model. MassDEP generally should avoid state-specific

[8] *Id.* at 6.

[9] U.S. EPA, Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes, at 121 (Nov. 2022), *available at* https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10168RA.pdf.

models, as any updates or changes to those models might reflect another state's energy priorities that Massachusetts might not share.

Among the "creditable" technologies, MassDEP identifies "bioenergy that is manufactured from waste feedstocks and does not adversely affect local air quality."[10] As a supplier of RNG, Ameresco is highly supportive of bioenergy as an eligible technology type.

However, Ameresco respectfully requests that any air quality requirements either be applied equally to any energy source or be omitted from the program. As discussed above, RNG combustion will greatly reduce air quality impacts compared to fossil natural gas. In contrast, fossil-based electricity sources may have significant local air quality impacts both within and outside of Massachusetts. If MassDEP intends to improve air quality through this program, it should apply uniform local air quality requirements across all energy sources.

This may, however, be unnecessary, when other permitting programs are designed specifically to address air quality. Ameresco's landfill gas-to-energy facility in Chicopee, for example, is permitted pursuant to G.L. c. 111, § 142B and § 142D and 310 CMR 7.00. Existing air permitting requirements already protect against non-GHG air pollutant emissions. MassDEP need not layer on additional requirements if a source already meets other air requirements. Any additional air quality requirements would be highly subjective and likely overlap with other permitting programs better suited to addressing air quality concerns. They would also potentially place significant burdens on staff administering the Clean Heat program. In addition to the already formidable task of having to evaluate the greenhouse gas impacts of various energy sources, staff would also have to evaluate the air quality impact of each source of building energy. It makes more sense to leave this task to staff who are focused on air quality permitting through other programs.

The Discussion Document asks whether "weatherization" should be creditable. MassDEP should consider crediting energy efficiency technologies in a Clean Heat Standard. California has an analogous program within the Low Carbon Fuel Standard ("LCFS"). Under the LCFS, entities that generate fuels with carbon intensities below the standard generate credits. However, the LCFS also incentivizes the installation of infrastructure to support the adoption low carbon transportation options. Specifically, it allows entities that do not supply fuel but have installed electric vehicle chargers to generate credits. Here, MassDEP has an opportunity to similarly incentivize entities to deploy technologies that will support decreasing building emissions by making weatherization creditable.

Along these lines, MassDEP should not categorically exclude combined heat and power ("CHP") systems from generating credits. CHP systems offer significant energy efficiency benefits and are promoted as part of the federal government's own sustainability initiatives.[11] Using RNG, CHPs can have even more significant carbon reduction benefits. CHPs should be

[10] Discussion Document at 6.

[11] U.S. Dept. of Energy, Combined Heat and Power Basics, https://www.energy.gov/eere/iedo/combined-heat-and-power-basics (last visited May 1, 2023).

able to be used to decrease the GHG impacts of energy used to supply buildings, and be rewarded if they do so. It would make no sense to discourage the installation of technology with significant GHG benefits in a program that is designed to do the opposite.

Similarly, MassDEP should not adopt a "threshold percentage standard of improvement" in GHG emissions reductions for certain technologies to qualify for credits.[12] Even technologies that "only marginally improve emissions" should be encouraged as long as those technologies make economic sense when GHG incentives are put into place.[13] For example, a technology that cheaply reduces statewide emissions by only a few percentage points may be equivalent to electrifying heat in thousands of homes, and affordable decarbonization solutions should occur in parallel with electrification.

Regarding who "owns" the credits, Ameresco respectfully requests that it be the fuel providers, not energy customers.[14] Assigning credit generation to the customer could undermine the entire program. It is the energy provider that controls the carbon intensity of the fuel source, and that must obtain credits to comply with the program. If credits are awarded to customers rather than energy providers, there would be a divorce between the entity providing the energy and the rewards for decarbonization. Further, involving customers in credit market would create hundreds of thousands or possibly millions of credit-generating entities, and MassDEP would have to track transactions across all these entities with obligated parties. The more sensible approach is to credit the fuel provider who will then provide lower-cost low-carbon fuel to outcompete conventional fuel sources. The fuel producer will also have the incentive to subsidize technology such as fuel pumps that will allow the transition to low-carbon electricity.

Finally, regarding third-party verification, the Commonwealth should ensure that verifiers are independent and operate at arms-length vis-à-vis regulated parties.

Topic 4 – Compliance Flexibility and Revenue

MassDEP's Discussion Document also addresses an alternative compliance payment ("ACP") mechanism. Such a mechanism would effectively be a price cap on credits. MassDEP should set any ACP mechanism carefully. Used correctly, the ACP could prevent negative outcomes, such as unnecessary volatility in credit markets. Yet if set too low, the ACP might undermine the Clean Heat Standard by depressing credit prices, an outcome that would run counter to the goal of encouraging decarbonization at rates required to meet compliance curves. The Appendices to the Massachusetts Clean Energy and Climate Plan for 2025 and 2030 recognize that the ACP should be "an option of last resort."[15] Ameresco believes that any price

[12] Discussion Document at 6.

[13] *Id.*

[14] *Id.*

[15] Appendices to the Massachusetts Clean Energy and Climate Plan for 2025 and 2030, at 67, *available at* https://www.mass.gov/doc/appendices-to-the-clean-energy-and-climate-plan-for-2025-and-2030/download.

ceiling through an ACP should be set at a level high enough to only prevent extreme price spikes, but otherwise allow market incentives to strongly encourage decarbonizing behaviors.

Interactions with Other Programs – Credit Stacking

MassDEP should allow Clean Heat Standard participants to stack credits from other policies and programs, such as tax credits under the Inflation Reduction Act, EPA's RFS program, and the Massachusetts Brownfields Tax Credit program. Credit stacking encourages program participation by creating greater incentives to deploy low-carbon energy sources. Credit stacking can also help smaller clean energy projects become economically viable. MassDEP should use all available tools to promote low-carbon energy, including by allowing credit stacking in the Clean Heat Standard.

New Fossil Infrastructure

The Final Report of the Massachusetts Commission on Clean Heat states, "Consistent with decarbonization goals and building on recent legislation amending Mass Save, installation of new fossil fuel equipment and services should not be supported under the CHS."[16] MassDEP need not propose as part of any Clean Heat Standard a ban on new, non-electrification-related infrastructure. Existing gas infrastructure can accommodate clean heat sources, such as RNG and, potentially, clean hydrogen. Seven northeastern states, including Massachusetts, recently submitted a proposal to U.S. Department of Energy ("DOE") for $1.25 billion in federal funding for a Northeast Regional Clean Hydrogen Hub.[17] The goal of these hubs, for which Congress has appropriated up to $8 billion under the Bipartisan Infrastructure Law, is to "create networks of hydrogen producers, consumers, and local connective infrastructure to accelerate the use of hydrogen as a clean energy carrier that can deliver or store tremendous amounts of energy."[18] MassDEP's Clean Heat Standard should complement Massachusetts broader goal to become part of the six to ten regional hydrogen hubs that DOE is funding.

Limiting new fossil infrastructure may also have unsafe consequences. It could draw attention away from communities with aging gas infrastructure where maintenance and repairs are necessary. The communities least prioritized for such upgrades are often environmental justice and other vulnerable communities. MassDEP should consider whether a standard that has as a blanket goal no new gas infrastructure could lead to unintended negative consequences.

* * *

[16] Massachusetts Comm'n on Clean Heat, Final Report, at 46 (Nov. 30, 2022), *available at* https://www.mass.gov/doc/massachusetts-commission-on-clean-heat-final-report-november-30-2022/download.

[17] New York State Energy Research and Development Authority (NYSERDA), Press Release, *Seven States in NE Regional Clean Hydrogen Hub Announce DOE Proposal for Funding and Designation as a National Hub* (Apr. 7, 2023), *available at* https://www.nyserda.ny.gov/About/Newsroom/2023-Announcements/2023-4-7-Seven-States-in-Northeast-Regional-Clean-Hydrogen-Hub.

[18] U.S. Dept. of Energy, Regional Clean Hydrogen Hubs, https://www.energy.gov/oced/regional-clean-hydrogen-hubs (last visited May 1, 2023).

Ameresco strongly supports reducing GHG emissions in the building sector through a Clean Heat Standard. To ensure that clean fuels are prioritized, MassDEP should propose a technology-neutral Clean Heat Standard that credits RNG and other clean fuels based on their lifecycle GHG emissions reductions relative to fossil sources. Ameresco thanks MassDEP for its attention to this comment.

Respectfully,

Michael Bakas

Michael T. Bakas

Formal response and/or questions are to be emailed to: climate.strategies@mass.gov.

May 1, 2023

Re: Anew Climate, LLC Comments in response to MassDEP Stakeholder Discussion Document – CHS Program Design

Anew Climate, LLC (Anew™) would like to thank the Massachusetts Department of Environmental Protection (MassDEP) for the opportunity to comment on "MassDEP Stakeholder Discussion Document Clean Heat Standard Program Design – March 2023".

Anew was formed through the merger of Element Markets and Bluesource in February 2022. It is one of the largest climate solutions providers in North America and, through its legacy companies, has a successful track record in supporting client companies in quantifying and reporting on their greenhouse gas ("GHG") inventories and developing corporate climate strategies and targets, with a decade-long reputable program participation in various decarbonization programs such as the federal Renewable Fuel Standard and California Low Carbon Fuel Standard. Our dedicated staff of 160+ employees possess in-house life cycle analysis ("LCA") expertise, with extensive and in-depth knowledge of the GREET model and other national and international LCA frameworks.

After reviewing the Stakeholder Discussion Document, the 48-page appendix in the 2025/2030 CECP, the Draft Regulation of Emissions Reporting Requirements for Heating Fuel Suppliers, and a program presentation prepared by the Conservation Law Foundation, we recognize that MassDEP is focused on the long-term objective of a mostly electrified thermal sector while also supporting the immediate emissions reductions that accompany fuel-switching to low carbon fuels.

We appreciate the ability to contribute to the public comment process. The importance of equalized incentives for all waste-derived fuels within the Clean Heat Standard cannot be overstated.

Topic #1 – Setting the Standard

Should the standard be expressed in terms of GHG emissions reductions, clean heating energy supplied, or something else such as square feet of conditioned space converted to clean heat?

Overall, Anew supports the standard being expressed in GHG emissions reductions and structured around a carbon-intensity based model. This design is proven to result in emissions reductions, as evidenced by the California and Oregon LCFS programs, and is anchored by tested methods of rigorous lifecycle analysis to ensure tangible and meaningful emissions reductions.

We believe MassDEP will find the scientifically proven, oft tested, and broadly adopted nation-wide adapted federal GREET model to be the most reasonable fit. Credit-based markets across the nation and even internationally have thrived after implementation of GHG emissions reductions and carbon-intensity focused programs based on methodologies like GREET. These programs are also present in many other geographic areas focused on long-term electrification.

In a late 2022 statement, Caitlin Sloan, VP for Massachusetts at the Conservation LawFoundation said that "any clean heat credit that is given to these fuels should depend on a rigorous analysis of lifecycle emissions." We would like to affirm that sentence and advocate that the carbon-intensity based GREET model would be the most meaningful adherence to that statement.

Topic #2 - Regulated Heating Energy Suppliers

Anew agrees wholeheartedly with inclusion of gas utilities, fossil heating fuel suppliers, and small fuel deliverers as obligated parties under the Clean Heat Standard. However, we believe that it is equally, if not more important, that large customer aggregators and wholesale deliverers of fossil heating fuel be obligated to acquire clean heat credits as well.

If wholesalers and aggregators are included as obligated parties under the Clean Heat Standard, much more impactful emissions reductions can be incentivized and monitored at a fraction of the administrative burden associated with tracking and reporting only parties of a certain size.

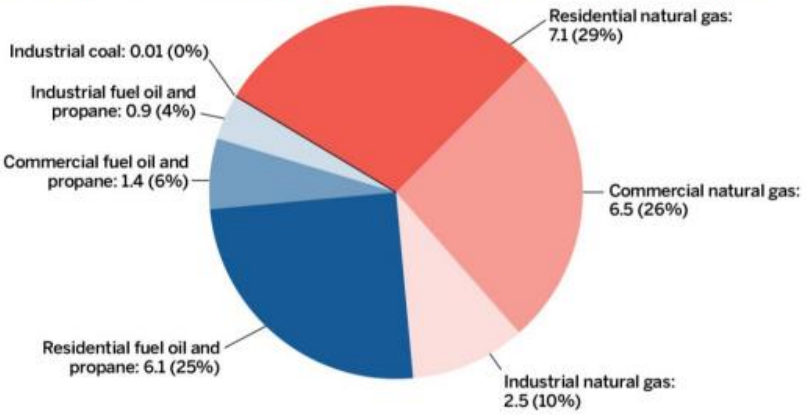
Topic #3 – Credit Generation

Which clean heat technologies should be eligible for crediting under the CHS? When and how should new options, such as hydrogen and advanced biofuels, be evaluated?

Inclusion of low carbon fuels within the CHS program is an essential catalyst necessary to accomplish MassDEP's target of 1 MMT of annual GHG reductions per year. While we are aware of the favorable economics of full electrification in new construction and, in some cases, recently built offices, low carbon fuels provide decarbonization pathways for the entire thermal sector.

In retrofits, it would behoove MassDEP to incentive low carbon fuels, which are actionable today and slot in relatively easily within a crediting market. With the target of 1 MMT per year of emissions reductions between 2025-2030 and 65% of all thermal emissions originating from conventional natural gas, Massachusetts would have to displace approximately 12 Million MMBtu of fossil gas annually.

Figure 1. Massachusetts 2018 thermal fossil fuel greenhouse gas emissions (million metric tons CO_2)



Data source: Massachusetts Department of Environmental Protection. (n.d.). *MassDEP Emissions Inventories*. Appendix C

The electrification required to displace this amount of heating emissions in existing buildings is not economical at scale in most cases, and the immediate value of realizing emissions reductions using waste-derived fuels outweighs waiting for obligated parties to take action on electrification.

In the Stakeholder Discussion Document, MassDEP postulates that current-generation crop-based biofuels should not be a viable credit generating source of clean heat. Anew agrees with this statement - it is also inherently incorporated into the proven federal GREET and CA LCFS (*California GREET*) lifecycle analysis models. Within CI-based market mechanisms such as the CA

LCFS and the underlying scientific research performed by Argonne Labs on life-cycle analysis, current-generation crop-based biofuels are assigned relatively high CI-scores and therefore correspondingly low credit value. In evaluating the GREET models, MassDEP will find that its concerns about the disadvantages of certain fossil fuel alternatives such as those crop-based fuels, are addressed meticulously. The LCA modeling framework properly values methane avoidance and total lifecycle emissions reductions resulting from advanced biofuels.

Topic #4 -- Compliance Flexibility and Revenue

Should the standard include an ACP option? If so, how should the payment level be established?

Anew is supportive of the concept of a price cap mechanism, executed through the "Alternative Compliance Payments." However, this ACP level should only be implemented if there is a complementary price floor which protects the stability of the crediting system throughout the expected timeframe of its existence (2025-2030). In practice, this combination of a ceiling and floor will serve as a price collar, which strengthens participation in the program and prohibits obligated parties from treating the Clean Heat Standard as a de facto tax of doing business. The price floor should be set relatively high to discourage companies from opting to pay the "default delivery agent", who will then be saddled with the logistics of implementing the bulk of the technical implementations while resource or time constrained (or both). The goal of the payment level should be to encourage each fuel supplier to complete decarbonization projects such as fuel switching, in lieu of simply paying a compliance payment, and a price collar is an effective way to achieve that goal.

Misc. Topics -- Interactions with Other Programs & Economic Analysis

Are there cases where "double dipping" to earn incentives from multiple programs should be prevented, or possibly encouraged such as to support LMI energy consumers?

It is Anew's opinion that value stacking from overlapping incentives should be allowed. From our experience, program overlap is positively correlated with participation in the market, and participation is critical for what would be one of the first CHS programs in the United States and a pioneer in the thermal industry decarbonization space.

Conclusion

We support MassDEP's overall goal of promoting emissions reductions in the thermal sector, and strongly advise that all waste-derived feedstocks be eligible for Clean Heat Credits. The general structure for Massachusetts' standard should be built around a carbon intensity scaled and technology-neutral model that promotes a level playing field for all decarbonization efforts. We thank you for the opportunity to submit these comments.

Sincerely,

Anew Climate

Lamb, Emily (DEP)

From: Ed Taft <Edward.Taft@AUTHFUELS.COM>
Sent: Friday, April 28, 2023 11:25 AM
To: Strategies, Climate (DEP)
Subject: Comments on proposed CHS regulations

April 28, 2023

To whom it may concern,

My name is Edward Taft. My wife Joan and I own Auth Fuels, a heating oil supplier in East Longmeadow Massachusetts that has been serving our community since 1934.
I am writing you to voice our concerns over the proposed Clean Heat Standards. This proposed legislation will be devastating to our industry, causing hardship to our business,
including the families of our 20 employees, and the roughly 3000 customers we serve.

Many of our customers are senior citizens living on a fixed income, and even with rebates and incentives, would never be able to afford to convert their homes to heat strictly with heat pumps. I feel there are better alternatives to help reduce greenhouse gases, namely the increased use of bio fuels. I urge you to consider the many family owned businesses and homeowners who are already having difficulty making ends meet before you decide to draft life changing regulations on an industry that has done nothing but strive to keep all our customers warm and safe for 90 years.

Sincerely,

Edward Taft, President
Auth Fuels

Office: 413-737-1468
Cell: 413-433-6668

BEAT
Berkshire Environmental
ACTION TEAM

20 Chapel St., Pittsfield, MA 01201
413-464-9402 • www.thebeatnews.org

no fracked gas in mass.com
Protect Our Common Wealth
A Program of Berkshire Environmental Action Team

May 1, 2023

Massachusetts Department of Environmental Protection
100 Cambridge Street, Suite 900
Boston, MA 02114

Via email: climate.strategies@mass.gov

Re: Massachusetts Clean Heat Standard Stakeholder Input

Dear Commissioner Heiple,

We very much support the comments being submitted by Conservation Law Foundation, Green Energy Consumers Alliance, Acadia Center and others (CLF, et al).

Particular among those are the call for further stakeholder process regarding the Clean Heat Standard proposals.

"DEP should focus efforts in this program design and stakeholder consultation phase on soliciting input from environmental and energy justice advocates and communities,"

A market-based energy program without adjustment for income levels will lead to an inequitable distribution of burdens and benefits. … While higher income households can absorb increases in energy costs, energy bills take up a much higher share of a low or moderate income (up to at least 120% Area Median Income (AMI)) household's budget.[1]"

This is especially true, given the disparity in income from one region of the state to another. Area Median income can vary by as much as 69% between Massachusetts' South Coast and Boston. Indeed, substantially lower income (at least 66% less than Boston area) is prevalent throughout the state, including the Pioneer Valley and Berkshire County[2].

[1] Page 3, comments by CLF et al
[2] Please see Table A below

Please stick to the "MA Department of Housing & Community Development Emergency Rental & Mortgage Assistance Program Income Guidelines[3]".

Of particular concern are the points raised on page 3 ot the comments submitted by CLF, et al:

- without protection for renters, landlords can use subsidized incentives like a CHS or Mass save as a pretext for rent increases that can drive low and moderate income renters out of previously affordable housing.

- lack of a managed draw-down of the gas transmission system could result in the entire cost of infrastructure being borne by those least able to afford electrification and transition off the gas transmission system to cover its fixed costs

On the second point above, the CHS should include a strategy for a planned rapid draw-down of the gas transmission system that aids communities in transitioning section by section, allowing the gas utilities to shut down their system segment by segment, progressively minimizing the need for a sprawling, central infrastructure.

There should be no place in the plan for prolonging the life of existing gas transmission systems by employing other exotic combustibles that only slightly reduce emissions, such as those proposed by the utilities in their "Future of Gas" proposal filed under DPU20-80, rather than eliminate them by means of a rapid, steady, managed phase-out of gas transmission systems.

CLF's "Non-Combustion Clean Heat Standard Concept" serves multiple pathways for the obligated parties (fuel oil & propane wholesalers and gas utilities) to reach compliance with state emissions laws and regulations[4].

We implore DEP to coordinate with all departments that would be affected by an appropriately swift shift in heating policy and practice in the Commonwealth. We would also suggest adding the Department of Housing to the stakeholder process in the interest of maintaining fair affordable housing equity as any CHS is designed.

As stated in CLF, et al's comments:

"*DEP should design the balance of its stakeholder process with different tracks for different types of stakeholder.*

First, we recommend that DEP work with DEP and EEA's in-house environmental justice and community engagement experts to design stakeholder input opportunities for people who would be impacted by the program who are not themselves or do not employ professional advocates.

---

[3] "MA Department of Housing & Community Development Emergency Rental & Mortgage Assistance Program Income Guidelines" https://www.mass.gov/doc/erma-area-median-income-information/download

[4] Chart on Page 6 of comments filed by CLF, et. al.

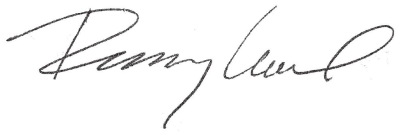
Second, we recommend that DEP hold a series of technical sessions on key design questions for technical stakeholders including the undersigned clean energy experts and advocates. We recommend at least the following topics for exploration in technical sessions:

- *Measure verification*
- *Compliance flexibility/banking*
- *Reporting*
- *Calculation of credits by technology*
- *Hybrid heat system credits*
- *Alternative Compliance Payment level*
- *Mass Save coordination"*

Thank you for your consideration of our comments as we move ahead with this essential system-changing work.

Respectfully submitted,

Jane Winn, Executive Director
Berkshire Environmental Action Team



Rosemary Wessel, Program Director
No Fracked Gas in Mass, A Program of Berkshire Environmental Action Team

Cc:
Bonnie Heiple, bonnie.heiple@mass.gov
William Space, william.space@state.ma.us
Christine Kirby, christine.kirby@state.ma.us
Melissa Hoffer, melissa.hoffer@state.ma.us

TABLE A

Boston

	Household Size							
	1 person	2 people	3 people	4 people	5 people	6 people	7 people	8 people
50% AMI Minimum Income	$44,800	$51,200	$57,600	$63,950	$69,100	$74,200	$79,300	$84,450
80% AMI Maximum Income	$67,400	$77,000	$86,650	$96,250	$103,950	$111,650	$119,350	$127,050

Pittsfield & larger Berkshire County towns

	Household Size							
	1 person	2 people	3 people	4 people	5 people	6 people	7 people	8 people
50% AMI Minimum Income	$31,850	$36,400	$40,950	$45,450	$49,100	$52,750	$56,400	$60,000
80% AMI Maximum Income	$50,900	$58,200	$65,450	$72,700	$78,550	$84,350	$90,150	$96,000

Rural Berkshire County

	Household Size							
	1 person	2 people	3 people	4 people	5 people	6 people	7 people	8 people
50% AMI Minimum Income	$29,900	$34,200	$38,450	$42,700	$46,150	$49,550	$52,950	$56,400
80% AMI Maximum Income	$47,850	$54,650	$61,500	$68,300	$73,800	$79,250	$84,700	$90,200

Pioneer Valley

	Household Size							
	1 person	2 people	3 people	4 people	5 people	6 people	7 people	8 people
50% AMI Minimum Income	$29,900	$34,200	$38,450	$42,700	$46,150	$49,550	$52,950	$56,400
80% AMI Maximum Income	$47,850	$54,650	$61,500	$68,300	$73,800	$79,250	$84,700	$90,200

South Coast

	Household Size							
	1 person	2 people	3 people	4 people	5 people	6 people	7 people	8 people
50% AMI Minimum Income	$29,200	$33,350	$37,500	$41,650	$45,000	$48,350	$51,650	$55,000
80% AMI Maximum Income	$46,650	$53,300	$59,950	$66,600	$71,950	$77,300	$82,600	$87,950

"MA Department of Housing & Community Development Emergency Rental & Mortgage Assistance Program Income Guidelines" https://www.mass.gov/doc/erma-area-median-income-information/download

May 1, 2023

Massachusetts Department of Environmental Protection
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: **Massachusetts Clean Heat Standard Stakeholder Input**

Dear Commissioner Heiple,

We appreciate the opportunity to provide expertise to inform the development of a proposed Clean Heat Standard ("CHS") regulation and related heating fuel supplier reporting requirements. The undersigned organizations represent stakeholders with a strong interest in equitably cutting building sector emissions to ensure that we meet our greenhouse gas reduction requirements. **Our top priorities for a CHS for Massachusetts are ensuring adequate equity protections and an electrification-only compliance program, particularly for gas utilities.**

The Clean Energy and Climate Plan for 2025 and 2030 ("2025 and 2030 CECP") and the final report from the Massachusetts Commission on Clean Heat both recommended the immediate pursuit of a CHS. The report highlights that a CHS "can be a powerful tool for creating a new market for clean heating solutions by incentivizing obligated parties to deliver cleaner heating technology, electrify our building stock, increase building efficiency, and move away from fossil fuels."[1] A CHS for Massachusetts can only be useful for meeting our decarbonization and environmental justice mandates if such a program is properly implemented. It is critical that the Commonwealth gets the difficult details of this complex program correct, such as ensuring that equity informs every aspect of the proposal and prioritizing electrification over industry greenwashing like alternative combustion fuels.

The below represents our thoughts and recommendations on the stakeholder topics and questions provided in the MassDEP Stakeholder Discussion Document, dated March 2023. Thank you again for the opportunity to comment and we look forward to working with you as this process unfolds.

[1] https://www.mass.gov/doc/massachusetts-commission-on-clean-heat-final-report-november-30-2022/download, at vi.

I. FURTHER STAKEHOLDER PROCESS RECOMMENDATIONS

DEP should design the balance of its stakeholder process with different tracks for different types of stakeholder. First, we recommend that DEP work with DEP and EEA's in-house environmental justice and community engagement experts to design stakeholder input opportunities for people who would be impacted by the program who are not themselves or do not employ professional advocates.

Second, we recommend that DEP hold a series of technical sessions on key design questions for technical stakeholders including the undersigned clean energy experts and advocates. We recommend at least the following topics for exploration in technical sessions:

- Measure verification
- Compliance flexibility/banking
- Reporting
- Calculation of credits by technology
- Hybrid heat system credits
- Alternative Compliance Payment level
- Mass Save coordination

II. OVERARCHING COMMENTS

Before responding directly to the specific questions posed in the Stakeholder Discussion Document, we offer overarching comments on 1) program equity and energy justice considerations and 2) cost-effective long term emissions reduction strategies.

A. Center Equity and Advance Energy Justice

1. Program design should focus direct and indirect benefits on customers with the highest energy bill burden.

DEP should focus efforts in this program design and stakeholder consultation phase on soliciting input from environmental and energy justice advocates and communities, including the co-conveners of the Environmental Justice Table (Greenroots, Inc., Neighbor to Neighbor MA, Alternatives for Community & Environment (ACE), Coalition for Social Justice, Groundwork Lawrence, and the North American Indian Center of Boston), low income advocates, and housing justice advocates to inform program design for equity and energy justice.

In the interim, the undersigned offer the following preliminary comments based on our past work in collaboration with energy justice movement leaders. We posit that DEP should begin to

consider the burdens and benefits of CHS program design through the dual lenses of direct/immediate impacts and indirect/longer term or associated impacts.

Direct Burdens of a CHS

A market-based energy program without adjustment for income levels will lead to an inequitable distribution of burdens and benefits. Direct or immediate customer burdens under a CHS are likely to be experienced as increased costs for heating fuels, passed through to the customer from the obligated party that supplies their heating fuel. While higher income households can absorb increases in energy costs, energy bills take up a much higher share of a low or moderate income (up to at least 120% Area Median Income (AMI)) household's budget. Energy bill increases can force a choice for low and moderate income customers between paying those bills and buying sufficient food that month. In high cost of living areas like most of the Commonwealth, there are many customers who do not qualify for low income energy bill relief but who still struggle to pay to heat their homes (generally, those between 61-120% AMI). It is also important to note that low and moderate income energy customers represent a disproportionate share of Black and Brown residents of the Commonwealth.

Indirect Burdens of a CHS

Black and Brown communities are disproportionately burdened by the negative impacts on health and quality of life resulting from our current heating fuel economy, including production, refinement, transportation, storage, and end uses of combustion fossil fuels and bioenergy. On the one hand, a CHS can help alleviate some of these burdens if it significantly reduces combustion. On the other hand, increased incentives for bioenergy combustion fuels are likely to lead to continued or elevated negative impacts on host communities for those fuels' supply chains.

Another potential indirect burden of a CHS is housing displacement. Without protections for renters, landlords can use incentives subsidized by ratepayer or tax dollars like a CHS or Mass Save for building upgrades as a pretext for rent increases that force out low and moderate income renters from relatively affordable housing units.

A CHS that accelerates unit-by-unit electrification of housing, while necessary in the near term, will contribute to the indirect burden of an unmanaged gas system transition. Gas customers who are least able, either financially or legally, to electrify their own homes will have to pay higher and higher shares of the fixed cost of the gas system absent significant modifications to rate design. See Section II.A.2 below for further discussion of this issue.

Direct Benefits of a CHS

The most direct benefits of a CHS designed to address equity issues would be energy bill adjustments to eliminate the bill impact of the CHS on low and moderate income customers. Directing the revenues from a Just Transition Fee like the one mentioned in DEP's Stakeholder Discussion Document to provide further energy burden relief for low and moderate income customers would be an additional direct benefit that could begin to ameliorate the energy burden concern.

Indirect or Delayed Benefits of a CHS

Clean heat technology and building envelope changes in a customer's home that are incentivized through Clean Heat Credits are either indirect benefits to customers (electrifying homes generally help with progress toward avoiding the worst impacts of climate change), or direct but delayed benefits (if done on that customer's home) including reduced energy bills, improved thermal comfort, increased property value, and improved indoor air quality. Equity and energy justice deficits in the delivery of comparable measures have dogged programs like Mass Save for decades.

We appreciate that DEP has begun to consider equity topics generally at this stage of CHS program design. We urge DEP to continue to develop its understanding of the direct and indirect burdens and benefits of a potential CHS, and focus both direct and indirect benefits on customers with the highest energy burden.

2. DEP should coordinate closely with DOER and DPU on key complementary strategies for equity.

Implementing equity protections and energy justice initiatives under a CHS will require close coordination with agencies including the Department of Energy Resources (DOER) and the Department of Public Utilities (DPU).

Rate Design

For moderate income customers to be able to meaningfully access the indirect benefits of a CHS, we will need an electric rate for customers using efficient electric heating. Potential direct benefits of the CHS for low and moderate income customers whose residences have not been electrified may also be delivered most effectively via electric (or gas) rates or bill adders. To be in position to execute these program elements, the DEP should establish a cross-agency working group, or utilize the 2022 inter-agency Clean Heat task force staff connections.

Alternative Portfolio Standard

The Alternative Portfolio Standard ("APS") incentivizes some clean heat technologies via a surcharge on electric rates. The 2025 and 2030 CECP stated that DOER would be conducting a rulemaking to align the APS with CECP priorities. While we urge DEP to work with the legislature to eliminate the APS, as detailed more fully in response to the Interactions with Other Programs Topic below, DEP should work with DOER to ensure that efforts are not wasted on a futile program redesign.

Managed Transition Off of Gas

As mentioned in the indirect burden discussion in Section II.A.1 above, perpetuation in the medium to long term of the unmanaged transition off of gas that is already underway will be an inequitable disaster for low and moderate income gas customers. Gas rates are increasing due to increases in fixed costs of the system, even before implementing programs like the CHS.[2] As gas rate increases accelerate and those fixed costs are spread across fewer and fewer customers with increasing electrification, customers who can afford to electrify will do so and customers who can't afford to electrify, or whose landlords won't electrify, will be stuck with skyrocketing rates.[3] An equitable and least-cost transition off of gas will require creating and executing a plan for strategic decommissioning of street segments and neighborhoods and transition to thermal heating networks and individual home heat pumps based on local electric capacity data and maximizing for avoided costs. This transition will require a restructuring of the gas utility sector on the order of the Commonwealth's electric system restructuring.

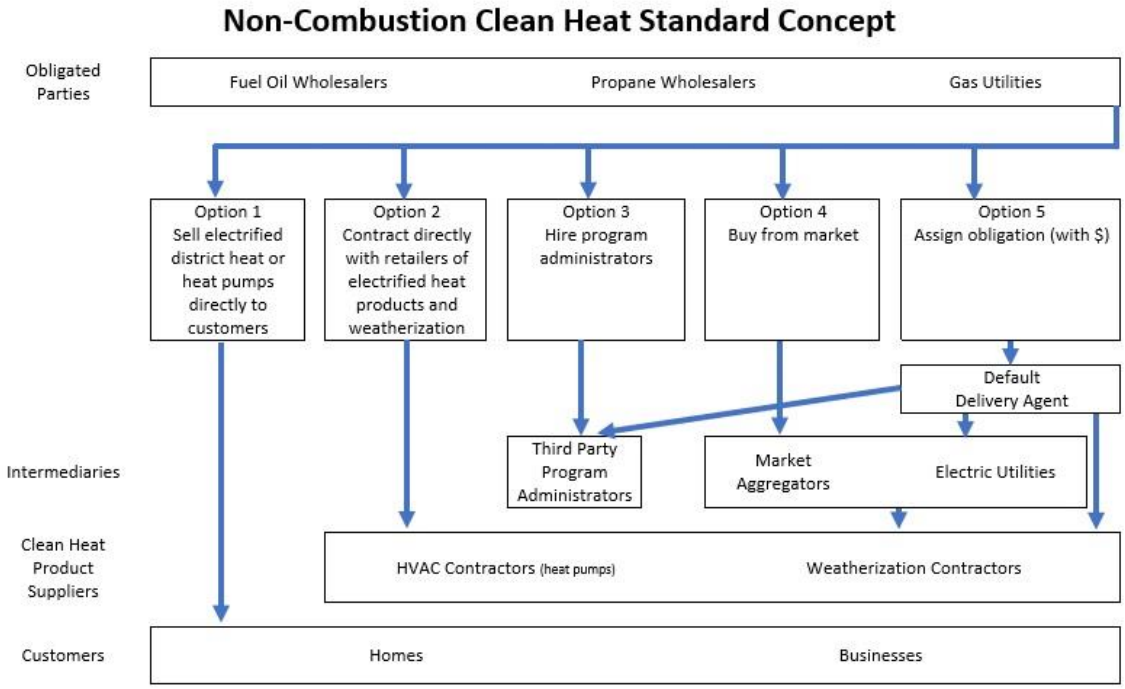
Despite nearly three years elapsing since now-Governor Healey filed her Future of Gas petition with the DPU, the Commonwealth has barely begun to reckon with this challenge. The Gas System Enhancement Plan Working Group required by the 2022 Act Driving Clean Energy and Offshore Wind[4] and the anticipated interim Order in DPU 20-80 may begin to make progress on gas utility restructuring, but in any event DEP should be working with DOER and DPU to force accelerated progress on equitable gas restructuring.

[2] See Conservation Law Foundation, Getting off Gas: Transforming Home Heating in Massachusetts at 7-9 (Dec. 2020), https://www.clf.org/wp-content/uploads/2020/12/CLF_GasWhitepaper_GettingOffGas.pdf.
[3] See Building Decarbonization Coalition, The Future of Gas in New York State, pages 43-45 https://buildingdecarb.org/wp-content/uploads/BDC-The-Future-of-Gas-in-NYS.pdf.
[4] Ch. 179 of the Acts of 2022, § 68.

B. Prioritize the Most Cost-Effective Long Term Emissions Reduction Pathway

1. DEP should focus compliance pathways on non-combustion technologies rather than biofuel blending, particularly for gas.

The CHS must be designed with an eye toward 2050 emissions limit compliance as well as 2030. Full efficient electrification of homes, whether by individual heat pumps or networked geothermal solutions paired with weatherization, should be the emissions reduction priority of the program. Allowing bioenergy blending strategies to qualify for Clean Heat Credits, particularly in the case of fuels in the gas distribution system, is not consistent with 2050 mandates. Rewarding alternative fuel blending in the gas system with Clean Heat Credits incentivizes the continued use of combustion-only and hybrid heating systems. It also incentivizes near-term, marginal reductions in emissions that don't support the overarching, long-term, most cost-effective pathway towards net zero. As the 2025 CECP and the 2030 CECP noted, "While partial electrification through the use of such hybrid systems can provide significant GHG reductions by 2030, a hybrid strategy alone makes achieving net zero in 2050 more difficult and expensive for all customers."[5] The graphic below demonstrates how any obligated party under the CHS who is not allowed to simply drop in alternative combustion fuels to earn Clean Heat Credits would still have a range of options for program compliance.



Adapted from original RAP White Paper for Clean Heat Standard in VT, Figure 10, page 32 https://www.eanvt.org/chs-whitepaper/

[5] 2025 and 2030 CECP at 58.

2. *DEP should define "Heat" broadly across electrification technologies.*

Rather than only allowing credits for electrifying space heating appliances, DEP should define the universe of electrification technologies that can qualify for Clean Heat Credits to include any piece of equipment that currently combusts fossil fuels delivered by the obligated entities, with the caveat that any qualified heating equipment must be highly efficient and engineered for cold climates. In addition to furnaces and boilers, this would include water heaters, stoves, and clothes dryers. The Clean Heat Credit value for the equipment would be based on its projected avoidance of carbon emissions over its lifetime.

3. *DEP should use the High Electrification Scenario, not the Phased Scenario.*

Use of the 2025 and the 2030 Clean Energy and Climate Plan "Phased" Scenario to design the CHS is not justified and will likely lead to under-achievement of necessary emissions reductions for the buildings sector. Acadia Center raised alarm about calibrating CECP implementation to the Phased Scenario immediately after the CECP was published in July 2022, particularly as it relates to the balance of near-term emphasis on whole-building versus hybrid electrification approaches.[6] In an analysis prepared for Conservation Law Foundation, Synapse found that the likely CHS compliance portfolio under the Phased Scenario would leave a substantial gap between achieved and required sector emissions for 2030.[7]

The question of how many whole-building heat pump installations the CHS is targeting is critical – particularly in the next seven years as we move towards 2030. The 2025 and the 2030 CECP emphasized the Phased Scenario as the preferred pathway, but as Acadia Center pointed out in a detailed fact sheet responding to the 2025 and 2030 CECP the CECP does not clearly articulate why this scenario was preferred over the "High Electrification" Scenario.[8] Moreover, the two scenarios have very different visions for the target level of electrification by 2030. The key differences between these two scenarios are important to understand, because although the CECP promotes the "Phased" scenario as the best path forward throughout the report, their own analysis shows that the net costs of the Phased and High Electrification scenarios are nearly identical, with the "Flexible Load Sensitivity" version of the High Electrification Scenario actually being the lowest cost of any scenario analyzed, and about $0.2 billion cheaper than the Phased Scenario (Figure A.17 on page 24 of CECP Appendix A: Technical Pathways Modeling).

---

[6] Acadia Center, So Close, But Yet So Far: MA 2025/2030 Clean Energy and Climate Plan, https://acadiacenter.wpenginepowered.com/wp-content/uploads/2022/07/AcadiaCenter-CECP-Fact-Sheet.pdf.

[7] Synapse Energy Economics, "Massachusetts Clean Heat Standard: Policy and Regulatory Analysis" at slides 7-8, https://www.clf.org/wp-content/uploads/2023/03/Massachusetts-Clean-Heat-Standard-%E2%80%93-Policy-and-Regulatory-Analysis.pdf.

[8] See Note 6, at 3-5.

This is despite a number of charitable assumptions in the modeling that favor the Phased scenario – 1) Dramatically underestimating the level of methane leaks from the gas system; 2) Using an outdated (AR 4) global warming potential (GWP) for methane and failing to consider methane emissions on a 20-year timescale; 3) Not accounting for out-of-state GHG emissions from the production and transmission of both fossil fuels and biofuels; and 4) Making the blanket assumption that all biofuels (including 'renewable natural gas' and biodiesel) are GHG-neutral. Combined, these four assumptions are enough to significantly skew the analysis in favor of the Phased Scenario.

The Phased Scenario calls for about 6% of Massachusetts homes to rely solely on heat pumps for space heating by 2030 and 21% of homes to rely on a hybrid heating system by 2030 (Table E.3 Appendix E). This is in stark contrast to the High Electrification Scenario, which calls for about 18% of homes in the Commonwealth to rely solely on heat pumps for space heating by 2030, with an additional 10% of homes relying on hybrid heating systems (Figure A.6 Appendix A). **In other words, the Phased Scenario envisions about *one third* as many homes heated solely by heat pumps in 2030 and *twice* as many homes relying on hybrid heating systems in 2030.**

The Phased Scenario is also much less bullish on near-term full electrification of commercial buildings when compared to the High Electrification Scenario. The Phased Scenario calls for about 11% of commercial buildings to rely solely on heat pumps for space heating by 2030, with about 8% of commercial buildings relying on hybrid heating. The High Electrification Scenario calls for about 20% of commercial buildings to be heated solely by heat pumps in 2030, with about 3% of commercial buildings relying on hybrid heating. (Figure A.7 Appendix A). **In other words, the Phased Scenario envisions about *half* as many commercial buildings heated solely by heat pumps in 2030 and over *twice* as many commercial buildings relying on hybrid heating systems in 2030.**

Further, the 2025 and the 2030 CECP largely abstains from taking a position on whether decommissioning of the gas distribution system will be necessary to achieve climate goals and at what scale decommissioning will need to occur. The CECP instead makes inconclusive statements like, "Although Docket 20-80 has not yet been finalized, targeted decommissioning of the gas distribution system may be necessary to support a just and equitable transition toward electrified heating." There are, for example, no metrics in the 2025 and the 2030 CECP regarding miles of gas distribution pipes decommissioned. The Phased Scenario envisions the number of homes relying on some level of natural gas heating actually *increasing* 13% by 2030 compared to 2020 levels, while the High Electrification Scenario envisions the number of homes relying on some level of gas heating decreasing about 11% by 2030 compared to 2020 levels (Figure A.6 Appendix A). A clear vision for the future of the natural gas system is absolutely essential to accurately set whole-building electrification targets that inform the CHS.

III. SPECIFIC STAKEHOLDER QUESTION RESPONSES

Topic #1 – Setting the Standard

- **Does this general approach [described in Topic 1] to setting the stringency of the standard makes sense? If so, how could it be refined? If not, what alternative would be preferable?**
    - It is essential that the Commonwealth reduce emissions in the building sector to 15 MMT by 2030 as required in the CECP for 2025/2030. This figure includes emissions from residential, commercial, and industrial heating applications. We bring to your attention page 4 of the Discussion Document, paragraphs 1 and 2, which are inconsistent on whether industrial emissions are to be included in a CHS. Our position is that emissions from all three sectors must be included.
    - Assuming that industrial emissions are factored in, then we agree that building emissions should fall by 5.1 MMT over 5 years, or very close to 1 MMT per year. However, we recommend taking a different approach than requiring emissions to fall by a flat 7% per year. The problem with that approach is that the absolute emission reductions in the first year would be much higher than in the fifth (and subsequent years going out to 2050), much higher than 1 MMT in the first year, decreasing each year until the absolute emissions would be less than 1 MMT per year.
    - We favor an approach that would smooth out the absolute reduction in MMT to 1 per year by varying the percentage requirement as necessary. If industrial emissions are included and the starting point is 20.1 MMT in 2025, then a steady 1 MMT per year reduction could be achieved with a 5% standard in 2025, increasing to 7% by 2030.
    - An important reason to smooth out the absolute reduction is that the market for electrification will take time to mature. The supply chain and consumer demand will both be much stronger in 2030 than they will be in 2025.

Massachusetts Building Sector Emissions Reduction Pathway Assuming Constant

Year	Emissions Target (MMT CO_2e)	Annual Emissions Percent Decrease	Annual Emissions Absolute Change (MMT CO_2e)
2025	17.2	6%	N/A
2026	16.2	6%	1
2027	15.2	6%	1
2028	14.3	6%	0.9
2029	13.3	7%	1
2030	12.2	7%	1.1
Cumulative 6-Year Emissions Reduction	5.0		

- DEP also needs to develop a plan for optimal use of hybrid heat pump systems. Gas utilities currently lobby for a switchover point as high as 30-35° F, while the appropriate point based on modern heat pump efficiency should be no higher than 10° F. Gas heating systems that are retained as part of hybrid set-ups, controlled by the installer to be the primary source of space heating during the winter heating season,[9] cannot be misleadingly labeled "back-up" systems. These partial set-ups will not meaningfully contribute to a reduction of greenhouse gas emissions. DEP should hold technical sessions to work out how different hybrid systems function, what role consumers will play, and what type of controls will be in homes, among other topics.

- **Should the standard be expressed in terms of GHG emissions reductions, clean heating energy supplied, or something else such as square feet of conditioned space converted to clean heat?**
  - We agree that the standard should be set in terms of GHG reductions, but year-by-year GHG reductions through 2030 cannot be the only guiding principle for establishing the overarching structure of the CHS. In addition to program design elements that solve for equity, the CHS must be designed in a way that fully complements the most cost-effective path to economy-wide net zero emissions in 2050, including the most-cost effective path for strategic decommissioning of the natural gas system as the Commonwealth moves towards net zero.
  - With regard to understanding the GHG emissions reduction from an electrification measure, DEP should look to Mass Save's methodology for evaluating energy savings and benefits.

- **Is the carve out approach the best way to ensure progress on electrification, or are there other options that should be considered?**
  - Electrification and weatherization should be the only compliance options allowed, particularly for gas utilities. See Section II.B.1 above. Given the markedly different regulatory postures of gas utilities and delivered fuel companies, we recommend that DEP consider the two categories of obligated entities separately. For gas utilities, whether investor- or municipally-owned, the suite of compliance measures must consist entirely of electrification and weatherization and not include alternative combustion fuels, whether bioenergy or hydrogen-based.
    - Biofuels, and RNG in particular face several key fundamental challenges when considering any possible role in decarbonization of building heating: **1)** Limited availability of truly sustainable (e.g. non-energy crop) biomass feedstocks, particularly in New England. **2)** Opportunity cost associated with using a high-value resources (limited biomass feedstocks) in a relatively low-value decarbonization end use

[9] See D.P.U. Docket 22-149, Responses to the Attorney General's Second Set of Information Requests, Information Request AG-2-4, at 2, available at https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/17101289.

(building heat, a sector that is relatively easy to electrify) **3)** Wide variations in lifecycle emissions associated with biofuels based on production pathway **4)** High fuel cost that will increase as demand for biofuels across multiple sectors continues to increase **5)** Inability to solve core methane leak problem associated with the gas distribution system **6)** Lack of viable, long-term role in full decarbonization of the gas distribution system is incompatible with net zero targets.

- Hydrogen also faces several key fundamental challenges when considering its role in decarbonization of building heating **1)** Opportunity cost associated with using clean electricity to produce hydrogen for a sector of the economy (building heat) that is relatively easy to electrify. This opportunity cost applies both to renewable electricity generation land use and required capital investments. **2)** Overall inefficiency of the hydrogen production, transmission and combustion process relative to building electrification via heat pumps **3)** High fuel cost that will increase as demand for hydrogen across multiple sectors continues to increase **4)** Pipeline compatibility issues with hydrogen blends exceeding 7% of energy flowing through the gas distribution system **5)** Safety issues associated with combustion of hydrogen, particularly in residential settings **6)** Lack of low cost geological hydrogen storage in the northeast. **7)** Lack of a viable, long-term role in full decarbonization of the gas distribution system is incompatible with net zero targets.
- To the extent that any waste-derived gas bioenergy is available in the Commonwealth, the energy required to refine it to pipeline quality methane and methane leaks from the process and subsequent pipeline delivery mean that the waste gas bioenergy would be better flared or utilized on-site in electricity generation, high efficiency combined heat and power, or co-located industrial processes.[10] And hydrogen produced via renewable energy is simply an extremely low efficiency energy storage mechanism in the context of an end use that could otherwise be electrified. Alternative gasses are not a long term solution for the buildings sector, so incentives should not encourage buildout of these wasteful processes in the near term.[11]

[10] See D.P.U. 22-32, Conservation Law Foundation, Direct Testimony of Michael J. Walsh and Jonathan Krones at 6-9 (July 15, 2022), https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/15198064, and Acadia Center, D.P.U. 20-80 Alternative Regulatory Proposal Comments at 8-12 (May 6, 2022), https://acadiacenter.wpenginepowered.com/wp-content/uploads/2022/05/Acadia-Center-DPU-20-80-Regulatory-Proposal.pdf.

[11] See Bakkaloglu, et al., *Methane emissions along biomethane and biogas supply chains are underestimated*, ONE EARTH 5, 724–736 (2022) https://www.sciencedirect.com/science/article/pii/S2590332222002676 and D.P.U. 22-149, Statement of Robert W. Howarth, Ph.D (Jan. 4, 2023), https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/16840893. Conservation Law Foundation will be releasing a comprehensive bioenergy report in the coming months with modeling and analysis on this issue.

- With regard to delivered fuels, we reserve the right to comment on whether delivered fuel companies should be allowed to earn Clean Heat Credits for biofuels delivered to existing customers until more information is gathered about the supply of the biofuel stocks, including incremental costs, available volume, GHG accounting, and provenance.

- **How should the standard accommodate clean heat that is deployed before the program takes effect; should these systems count toward required "reductions"?**
  - Qualifying clean heat that is deployed before a CHS takes effect must be incorporated into the baseline for emissions reductions, and the standard should be annually reset according to the best available knowledge of the emissions inventory in the building sector. The Commonwealth is too far behind on necessary building sector emissions reductions to allow obligated entities to further delay compliance actions by pulling in past activity.

- **Is a carve-out a good approach to ensuring equity, and if so how could the specific requirement be determined?**
  - Carve-outs could help achieve equity goals but are insufficient alone to address equity issues created by the program. While carve-outs might be a valuable tool to direct weatherization and electrification toward customers who are not being adequately served by existing programs or who would not be served by a strict least-cost market approach to a Clean Heat Standard, DEP must do more to ensure that customers with the highest energy burden are not harmed by the program. See Section II.A above and responses to Topic 4 below for additional content on this topic.

- **Should the CHS be supported by a separate declining cap on emissions to ensure emissions outcomes, such as a "cap-and-invest" program for the building sector?**
  - We request further clarification from DEP on their understanding of a cap and invest program relative to a CHS. If a CHS is going to drive emission reductions towards 2030 and beyond, then the amount of clean heat credits that an obligated entity must create or obtain each year should correspond to an annual cap on emissions. The CHS and the declining cap support each other. Whether there should be a separate cap and invest program is another question.

Topic #2 – Regulated Heating Energy Suppliers

- **Which companies should be subject to the standard?**
  - First, it is imperative that electric utilities NOT be included as obligated entities. A properly designed CHS needs to focus on driving efficient electrification and weatherization that is not already happening under existing programs, and needs to help shift the costs of this transition from electric bills to fossil fuel bills.
    - Replacement of less efficient heating under the purview of electric utilities (electric resistance) is already robustly cost effective under the

Green Communities Act (i.e. Mass Save). While the Commonwealth needs to continue to make it easier for electric resistance customers who have not yet switched to access heat pumps, this can be done via the compliance measures element of CHS program design. See Option 2 in the graphic included with Section II.B.1 above.

- Gas utilities, including municipal gas utilities, must all be obligated entities under a properly designed CHS. We are currently agnostic as to whether gas suppliers should also be obligated entities, as long as every gas therm delivered in the Commonwealth is accounted for in setting a gas utility and/or supplier's compliance obligation and alternative gas fuel blending is disallowed as a compliance pathway. It may be most administratively efficient to regulate only the delivery utilities, while including suppliers as obligated entities could create a more robust market for Clean Heat Credits generated by third party heat pump and weatherization vendors.
- Oil and propane providers should also be subject to the standard. According to the Energy Information Administration "Residential Consumption Survey released in March 2023, delivered fuels serve 27% or 690,000 homes in Massachusetts. Exempting suppliers of these fuels would almost certainly make it impossible to achieve the aforementioned 1 MMT of GHG reduction per year necessary. It would also be unfair to low- and moderate- income consumers of gas utilities who would be affected by the imposition of the standard on gas entities.

- **How can compliance be streamlined for small fuel suppliers?**
  - As stated above, we will withhold judgment on whether the obligation should be on wholesalers or retailers until further information is provided. This is an example of a topic that could be addressed in technical stakeholder sessions.

- **Should municipally-owned gas and electric utilities be treated differently under the standard? If so, how can this be accomplished in a manner that is fair to customers of fossil fuel suppliers that operate in multiple utility service territories?**
  - All electric utilities should be excluded from obligated party status, including municipal electric utilities. The Commonwealth's four municipal gas utilities should be regulated alongside the other gas utilities for the purposes of the CHS. It would be particularly unfair to impose another obligation on investor-owned utilities (that would be passed onto their customers) while exempting municipal gas utilities.

Topic #3 – Credit Generation

- **Which clean heat technologies should be eligible for crediting under the CHS? When and how should new options, such as hydrogen and advanced biofuels, be evaluated?**
  - The CHS should credit efficient electrification and weatherization only, particularly in the context of gas utilities and/or suppliers. We are opposed to crediting biomethane, hydrogen, or synthetic fuels blended into the gas

distribution system. See discussion in Section II.B.1 and in response to Topic 1 above. DEP states in Topic 3 that "clearly… bioenergy that is manufactured from waste feedstocks and does not adversely affect local air quality" should be credited. To the extent that this refers to biomethane, we strongly disagree. To the extent that this refers to liquid biofuels, we are withholding a definitive position regarding advanced biofuels as "drop-in" replacements for #2 heating oil and propane until a thorough analysis is conducted by DEP on the supply and emissions profile of these fuels. Specifically, it is important to understand the cost of biodiesel before and after federal incentives, the quantity of potential feedstocks, and the provenance of potential feedstocks. If DEP considers allowing liquid biofuel blending to qualify for Clean Heat Credits, it could consider requiring the obligated entity to prove that a certain percentage of their customers use oil as backup for a heat pump.

- **How should the amount of credits be calculated for the eligible technologies? What existing calculation methods could MassDEP consider, reference, or adopt?**
    - As a starting point, we recommend that DEP consult with DOER to reference the Technical Resource Manual used by Mass Save to determine the energy savings and GHG reduction attributable to heat pumps and weatherization. This question is truly key to the whole program design. To get it right, we recommend that DEP and DOER jointly conduct a focused set of technical sessions with stakeholders.
    - We propose the following grounding principles for consideration: 1) any methodology must take into account projected declines in electricity sector emission factors over the coming years; 2) lifecycle accounting must be used if any biofuels are deemed an eligible technology, and if DEP uses existing models for lifecycle accounting they must adjust for local conditions; and 3) DEP needs to closely examine how to credit hybrid heating systems, as two homes with identical "hybrid" set ups could be using 100% electric heat or 100% fossil heat in the winter.

- **Is it necessary to develop emission factors for electricity, or can electricity be counted as a zero- emissions energy supply for crediting purposes given the CES requirement to decarbonize the electricity supply? Are there other aspects of electrification emissions that should be incorporated in the standard, such [as] seasonal emissions factors or refrigerant emissions?**
    - In order to drive the levels of electrification called for in the 2025 and 2030 CECP and Commission on Clean Heat Final Report, and given that electric sector emissions are already counted in a different sector of the Commonwealth's emissions inventory, for the purposes of a properly designed CHS electricity should be counted as zero-emissions in the case of qualifying electric heat pumps and appliances replacing fossil fuel heating equipment and appliances. How to treat both 1) Heat pumps replacing resistance heating and 2) weatherization of partially/fully electrically heated buildings will require

further coordination with MassSave that should be discussed in technical sessions.

- Given the more pressing local public health impacts from co-pollutants released in combustion appliances, DEP should still assume zero emissions from heat pumps in the initial design of the program despite the GWP of leaked refrigerants. DEP should continue pursuing refrigerant emissions reduction strategies in the supply chain and installer community, including incentivizing factory sealed heat pumps, refrigerants with lower GWP, contractor retraining, and higher payments for returning the refrigerant post decommissioning.

- **Should weatherization be credited in the absence of other clean heat? How can weatherization crediting be calculated for projects that include clean heat?**
  - DEP should use Mass Save's generally accepted energy efficiency accounting of avoided emissions for crediting weatherization in the absence of other equipment installations.

- **Should MassDEP require third party verification? If so, what specific requirements are appropriate?**
  - Verification will be critical to the credibility and emissions reduction efficacy of a CHS, and also one of the more challenging aspects of program design. DEP should first consider the data that can be obtained from gas and electric utilities. Historically, the Commonwealth's utilities have been more protective of their customers' data than they are of their customers' planet and future. DEP and partner agencies should not settle for the utilities' usual prevarication on this subject. Additional verification options may be surfaced via a technical session. The best approach for verifying the extent to which electric heating is being utilized in hybrid heating arrangements or "fully electrified" buildings in which the "emergency only" fossil fuel heating system is still operable will be a topic of critical importance that demands further attention in technical sessions.

- **How should MassDEP define and identify credits that support equitable outcomes?**
  - As we discuss in Section II.A.1 above, credits that support equitable outcomes are a potential indirect benefit of a CHS. In addition to consultation with stakeholders with lived experience of the equity pitfalls of programs like Mass Save, DEP could consider the following incomplete list of potential equity priorities for delivery of indirect benefits: Title I schools, community health centers, food pantries, homeless shelters, and warming centers. Per Section II.A.2 above, DEP should also consider enhanced incentives for networked geothermal projects that migrate entire street segments off of gas.

Topic #4 – Compliance Flexibility and Revenue

- **Should the standard include an ACP option? If so, how should the payment level be established?**

- Yes, there must be an ACP option. It is unclear how the program would work cost effectively without one. The level should be sufficient to provide the incentive needed to electrify one home. The ACP payment level will not necessarily match the current $10,000 incentive level established by Mass Save. We note that while DEP states in the Topic 4 discussion that "[T]he Mass Save program has already established $10,000 as an appropriate incentive for conversions to a fully electrified home", Mass Save's incentive levels have not demonstrated the ability to scale heat pump adoption, particularly among LMI households, at the speed and scale necessary to match the levels of adoption necessary to achieve the CECP emissions targets. The appropriate methodology for determining the proper ACP level to achieve the building electrification goals necessary to comply with CECP Buildings Sector GHG emissions targets is a topic of critical importance that should be further discussed in technical stakeholder sessions.

- **Are other revenue generation options, such as a building sector "cap-and-invest" program, necessary or desirable for addressing equity or other revenue needs?**
  - Other revenue generation programs or opportunities will definitely be necessary to fund equitable building sector electrification (however, these are generally outside the purview of DEP):
    - As mentioned above, electric utilities should continue to work towards reducing emissions associated with electric heating, both by targeting resistance electric heat to heat pump conversion opportunities and improving envelope efficiency of all-electric buildings.
    - A state appropriation in support of the Zero Carbon Renovation Fund.
    - Issuance of bonds to decarbonize public buildings.
  - Additional mandates will be necessary to drive private sector funding toward building sector electrification:
    - A statewide Building Performance Standard, starting with buildings greater than 20,000 sf.
    - All-electric building codes so that HVAC systems installed this decade will not have to be replaced in the 2040s.
  - Please refer to our response to the final question under Topic 1 regarding the relationship of a cap and invest program to a CHS.

- **What are the best ways to use revenue? For example, should all revenue be used to fund new clean heat or would it be appropriate to provide ongoing support to LMI customers that fully electrify their homes (e.g., direct bill assistance, free routine maintenance, etc.).**

- CHS program revenues (primarily from Alternative Compliance Payments) are a variable funding stream that can be directed toward remedying the direct burdens of a CHS with a direct benefit to customers in the form of bill relief for LMI customers through existing programs run by the Low Income Energy Assistance Network and community action agencies. It will also be necessary to direct portions of the revenue to installations of clean heat equipment to keep making progress toward the program's emission reduction goals. Prioritizing low and moderate income customers for at least 40% of those benefits (see Section II.A.1) is appropriate from an equity perspective.
- In the longer term, DEP should work with DOER, DPU, and the Attorney General's Office to pursue electric rate reform strategies for equity and energy justice.

- **Are there other flexibility components that may be appropriate, such as multi-year compliance or credit banking?**
  - Generally yes, but we reserve the right to make further comment upon seeing a more detailed proposal. This is an important topic that should also be covered in a series of technical sessions. A certain amount of flexibility may be required to deliver resource-intensive distributed electrification. Less to no flexibility should be granted if DEP allows liquid bioenergy blending.

- **Are the flexibility options presented here sufficient to address weather variability, or will some other approach be needed, such as weather-normalization of reported data?**
  - It will be necessary to weather-normalize reported data in order to adjust each year's Clean Heat Credit quota. We recommend that the quota be set in the first few years assuming heating degree days below the average of the last five years in order to reduce the chances that emission reductions will come in lower than desired.

Topic #5 – Reporting Requirements for Heating Energy Suppliers

- **How should MassDEP structure the reporting requirements for delivered fuels to ensure that all emissions from heating homes and businesses in Massachusetts are reported while minimizing the administrative burden of reporting?**
  - As we noted in response to Topic 2, we would need to see more information before providing an opinion on this topic. We recommend that DEP hold technical sessions on this topic.

- **Should any exceptions or special requirements be included, such as for cooking fuel or for synthetic fuels such as "renewable diesel"?**
  - No. The emissions and equity impacts of special fuel types should be handled through other aspects of program design.

- **How often should reporting be required (monthly/quarterly/annually)?**

- Reporting should be required quarterly from all obligated entities. The data that is currently required to be reported under Mass Save, including which customers were served along the parameters of measures delivered, residential vs. commercial, building type, residential vs income-eligible, by town or zip code, should be considered the baseline. Reporting for hybrid heating situations will be complex and should be developed via technical sessions.

Interactions with Other Programs

- **Are there cases where "double dipping" to earn incentives from multiple programs should be prevented, or possibly encouraged such as to support LMI energy consumers?**
  - DEP should avoid "double dipping" from an emissions accounting perspective, but enhanced incentives should be used to help achieve equity priorities. The CHS should be well coordinated with Mass Save for several reasons, one of which is to ensure that LMI consumers are well-served.

- **How can the APS program best be accommodated in the CHS program design?**
  - The initial program design of the CHS should ignore the APS. The APS should be eliminated, as the clean energy incentivization purpose of the program will be subsumed within the CHS and the current design of the APS is not aligned with the Commonwealth's emissions goals. As the Commission on Clean Heat stated in their Final Report, "Given that the APS was designed to incentivize combined heat and power, which it is now phasing out, and it is weak incentive for heat pump technology, we further recommend that the state consider eliminating the APS program and using the new Clean Heat Standard as a more effective program to reduce GHG emissions and support electrification in the thermal sector."[12] Removing the APS would help reduce electric rate impacts as more and more customers heat their homes with electricity. Logistically, DEP should encourage the legislature to repeal the APS while in the near term designing the CHS to ignore the APS. There should be no alternative gas blending qualified as a compliance measure in a properly designed CHS, so this would primarily result in a temporary additional incentive for electrification until the APS ends.

- **Should the program be supported by a declining cap on emissions/cap and invest program for the heating sector?**
  - See responses to prior cap and invest questions in Topics 1 and 4.

Economic Analysis

- **Consumers will incur energy costs, including costs of the clean energy transition, regardless of whether MassDEP pursues a CHS. How can incremental impacts of a CHS be isolated from these costs?**

[12] Final Report of the Clean Heat Commission, at 46.

- From now through 2050, it will be extremely difficult to sort out to what extent heating costs will change as a result of policies like the CHS, Building Performance Standards (BPS), appliance standards, building codes, technological advancements, changes in electricity costs (which impact the cost of electrification), various market factors, and exogenous factors such as geopolitical situations (i.e. Russia vs. Ukraine). It is more important for DEP to monitor all aspects of the clean energy transition and to determine whether benefits and costs are being allocated fairly and efficiently.

- **What information sources could MassDEP consider or rely on if there is a need to project future prices of fuels, heat pump installations, etc.?**
  - It is impossible to project fuel prices on a long-term basis to a degree of certainty that would guide good policymaking. Further, most consumers make their decisions on heating equipment based upon their understanding of current equipment costs and their intuition about the long-term cost of fuel. They do not make purchase assumptions based upon a forecast from EIA or DOER. To achieve the requisite GHG reductions, Massachusetts must install about 100,000 heat pumps per year until every building is electrified. For that reason, it would be of great value to continually monitor developments in the markets for air-source and ground-source heat pumps (including networked geothermal). At present, there are no credible predictions of where heat pump costs will be in 5 or 10 years. The purpose of trying to project future heat pump costs is to help determine what, if anything, government can do to reduce the costs of installation, operations, and maintenance.

- **How could economic benefits be quantified, such as the macroeconomic benefit to Massachusetts of substituting spending on local heat pump contractors for spending on imported fossil fuels?**
  - One potential approach is to quantify economic benefits leveraging a similar approach as the Massachusetts 2050 Decarbonization Roadmap. The Roadmap utilized IMPLAN, a widely used input-output economic analysis software package, to evaluate expected economic impacts in the state for various net-zero complaint pathways. The Roadmap found that pathways that invested in local energy resources, including renewable electricity generation, electrification, and energy efficiency, created more jobs and demonstrated greater economic benefits by keeping money local than the pathways more reliant on imported energy. For example, the "All Options" pathway from the Roadmap (which emphasized deep electrification and broad renewable electricity buildout) had 17% higher economic "output" (the broadest measure of economic activity) in Massachusetts per dollar invested than the "Pipeline Gas" pathway (which relied heavily on imported alternative fuels).[13]

[13] Massachusetts Decarbonization Roadmap, Economic and Health Impacts Report, Figure 7, page 14 https://www.mass.gov/doc/economics-and-health-impacts-report/download.

- **How can economic analysis be structured to inform equitable program design that benefits LMI energy consumers?**
    - The analysis should be holistic in nature taking into consideration upfront capital cost, operating cost, maintenance cost, air quality health benefits, job creation benefits, etc.

- **How can recent changes in federal incentives be incorporated into the analysis.**
    - The most relevant provisions of the Inflation Reduction Act with respect to clean heat are the following for residential consumers:
        - The HOMES rebate (Home Energy Performance-Based, Whole-House Rebate) offers generous support to homes that reduce energy usage by 25% or more. However, funding allocated to Massachusetts for this rebate is $73,233,910, which is tiny compared to what Mass Save spends in a year.
        - Similarly, the HEEHRA rebate(High Efficiency Electric Home Rebate) offers generous support to the electrification of low- and moderate-income households. However, funding allocated to Massachusetts for this is just $72,809,130. This is also tiny compared to what Mass Save spends in a year.
            - Note: Both rebates, HOMES and HEEHRA, will likely be spent before CHS goes into effect.
        - The federal tax credit (Section 25C) offers a 30% tax credit of up to $2000 per year for air-source heat pumps, heat pump waters, and electrical panel upgrades. Tax credits are also available for weatherization. Section 25D makes available at 30% tax credit, uncapped, for geothermal installations (both residential and commercial).
        - The Greenhouse Gas Reduction Fund (aka the Green Bank) is funded with $27 billion and an explicit mandate to promote equity and environmental justice. A Massachusetts version of the Green Bank can provide low-interest capital to projects capable of earning Clean Heat Credits.

    With all those resources, the Inflation Reduction Act will significantly help to defray the cost of electrification.

Thank you for the opportunity to comment. We look forward to working with DEP on additional stakeholder dialogue on this important topic.

Signed,

Comment Drafters
Conservation Law Foundation
Green Energy Consumers
Acadia Center
Pipeline Awareness Network
HEET

Additional Signatories
[]

Department of Environmental Protection April 29, 2023

RE: Discussion Draft Regulation and Stakeholder Discussion Document Program Design

I write to you today to carefully look at the impact of the Draft regulation for the CHS will have on the home heating fuels business.

I am the president of Brideau Energy and have been in business for 36 years serving over 10,000 customers in Central Mass with home heating oil and propane. As a company we have participated in the APS program since April of 2019 and continued for 3 years until the availability of APS product became harder to get. Today we are still delivering a renewable Soy based biofuel to our customers. We are currently reducing GHG emissions and should be part of the solution moving forward.

The current proposal is an escalating tax to remove our business from the marketplace replaced with electric heat. As a company we have been selling electric heat pumps for a number of years, however once the customer see's the cost and the modifications to their existing homes, most will stay with a fossil fuel. In our area we find the "pockets aren't so deep" for all the conversion costs.

I am also quite concerned that the DEP will not allow a renewable soy based bio fuel be available to reduce GHG emissions when there is not enough APS product available and all other states including and especially California that are producing a Low Carbon Fuel Standard will allow a soy based bio-fuel?

Limiting bio fuels availability, assigning a zero emission standard to electricity, not using the GREET model for applying credit values, appears that there is a definitive squeeze on the fossil fuel business. We all understand the need to reduce our carbon footprint in all aspects of our lives. My understanding is the best way is to use all available carbon reduction measures available.

Has anyone asked how and when the electric grid will be able to handle this forced move to electrification? Or will we just accept the fact that rolling blackouts will occur.

Please consider us part of the solution, delivering a renewable biofuel product to our customers rather than a government forced move to electrification. Let market forces determine what is the best product for the consumer.

Sincerely

Mark Brideau

President

MJT Enterprises, Inc.

Massachusetts Department of Environmental Protection,

I am reaching out to express our concerns with the Clean Heat Standard. We service over 4,000 customers in Barnstable County providing diesel, heating oil, and propane for many uses. Our local fisherman depend on us to sustain a living in their industry, businesses use the propane to cook supporting the tourism on Cape Cod, and we also supply heat to homes throughout the county.

Among the fuels we offer is bio which reduces greenhouse gas emissions.

We are concerned this initiative will come at an extreme cost to our customers which will have a lasting and irreversible negative impact on the industry. We have already heard feedback from customers who have installed heat pumps that they need our services in the cold months as the heat pumps cannot keep up in cold weather.

Thank you,
Cape Cod Oil & Propane

PO Box 993
Provincetown, MA 02657

Phone 508-487-0205
Fax 508-487-4752

May 1, 2023

Massachusetts Department of Environmental Protection
100 Cambridge St, Suite 900
Boston, MA 02108

Via email: climate.strategies@mass.gov
RE: Stakeholder Input on Proposed Clean Heat Standard Regulation

---

To Whom it May Concern:

Carbon Solutions Group LLC (CSG) has submitted the following comments regarding the proposed Clean Heat Standard (CHS) Regulation, in response to the solicitation for stakeholder input by the Massachusetts Department of Environmental Protection (DEP).

1. ***Open credit market with tracking system***

   A compliance market should be open to allow for aggregators and residential/commercial generators to participate in and sell credits. The New England Power Pool Generation Information System (NEPOOL GIS) provides a demonstrated example of a marketplace and tracking system that should be implemented.

2. ***Transition consistency for Alternative Energy Credits***

   Any changes to the Alternative Energy Portfolio Standard (AEPS) arising from the implementation of the CHS may impact the value of existing AEPS credits. A pathway for transition to the new/revised regulatory system for both Standards should be developed to protect the value of existing credits from previous vintages.

3. ***Clarity on Obligated Parties***

   Clarity at the outset of the development of the CHS Regulation on the inclusion of Electric Utilities as Obligated Parties should be provided to support decision making of potential market participants.

4. ***Multi-year Compliance Periods and Credit Banking***

   CSG supports the compliance flexibility proposed in the March 2023 Discussion Document to allow for multi-year compliance periods, and compliance credit banking and borrowing. We note that the flexibility instruments, including banking of credits, should be available to all participants in a credit market, including aggregators and residential/commercial generators.

CSG appreciates the opportunity to engage with DEP on the development of the CHS. Please do not hesitate to contact Daniel Sadik at dsadik@carbonsolutionsgroup.com or 512-492-5757, should you have any questions regarding our submission.

2045 W Grand Ave Ste B PMB #58751
Chicago, IL 60612, USA
(t) +1 312.638.9077
(w) carbonsolutionsgroup.com

Central Energy

My name is Martin J Topor, Since December 17th 1981 I have owned and operated Central Oil Company located at 206 Center St. in Chicopee Ma. My Son Christopher joined the company approximately 24 years ago and together we have worked to build what I consider to be an upstanding and dependable company.

We are a full-service heating company that sells and delivers heating oil, kerosene, and on road and off-road diesel. We deliver to commercial accounts, trucking companies, construction sites and supply double wall fuel tanks (on loan) to farms for seasonal use.

The suggestion of ending fossil fuels is foolish, the idea of converting 3% of our customers to heat pump just will not work, for example, a basic heat pump is good to 30 degrees Fahrenheit. The customer would need supplemental heat to satisfy the heating needs of that dwelling.

If there were multiple heat pumps at this residence the homeowner would have to shovel the accumulated snow from beneath the unit so that it would be able to defrost. Imagine an elderly person, shovel in hand trying to clear the heavy snow from a nor easter so the heat pump will thaw!

How do you expect an older home with a steam system using gas or oil to convert to a heat pump? The cost alone would be excessive. Upgrading the electrical panel, insulation, supplemental heat and the effectiveness of the new installation. Access to many rooms would be impossible, to just mention a few of the issues.

Who will compensate my company for sacrificing 3% of my base annually? In short you are going to put me out of business after 41 years of building up my establishment!!!

Subsidizing the interest for these installs is a dog chasing its tail, A customer takes a zero percent loan from Mass save and National Grid you steal the gas or oil customer then National Grid pays the interest on the loan for the customer you just stole! Just a vicious circle, the left hand stealing from the right hand.

My suggestion is simple, Stop the press, gather all thoughts and come up with a plan to correct the fossil fuel issues. This program is a shot in the dark! Not a plan that makes sense. If it takes five or ten years to create a useful plan, then let's do it!!! I am not opposed to clean air, and more efficient systems, lets just do it right the first time or don't do it at all.

Respectfully,

Martin J Topor Jr.

President

CENTRAL ENERGY
THE PURPLE PEOPLE HEATERS

City of Boston
Environment

May 1, 2023

Commissioner Heiple
Department of Environmental Protection
100 Cambridge Street, Suite 900
Boston, MA 02114

By Electronic Submission to climate.strategies@mass.gov

Re: Massachusetts Clean Heat Standard Stakeholder Input

Dear Commissioner Heiple,

The City of Boston appreciates the opportunity to provide input regarding the Department of Environmental Protection's (DEP) development of draft Clean Heat Standard regulations. As Boston continues to take steps to increase energy efficiency and reduce greenhouse gas emissions throughout the City, programs like the Clean Heat Standard can further accelerate decarbonization, strengthen the green economy, and help improve public health and resilience to the impacts of climate change for Bostonians and residents throughout the Commonwealth.

While this initial letter addresses a few high-level issues, the City looks forward to providing more detailed input in the future. With regards to future engagement, we encourage DEP to host technical working group sessions as well as a series of general and targeted stakeholder meetings.[1] For focused stakeholder meetings, we recommend that DEP include meetings specifically focused on municipal input to explore how a Clean Heat Standard would align with ongoing local initiatives.

In addition to considering coordination with ongoing municipal programs, we agree that it is important to understand and address interactions between a Clean Heat Standard and other state-level programs, including the Mass Save program and energy bill assistance programs. For

[1] As an example, Boston's stakeholder engagement process for BERDO, the program that regulates greenhouse gas emissions from existing buildings, includes a series of public technical stakeholder meetings and a parallel community advisory group, which is a dedicated space for environmental justice and community organizations to learn about the regulations and provide input. The technical meetings focus on a few topics at a time, for which advance notice is provided, and present straw proposals to elicit feedback. Participants are invited to share additional written feedback after meetings and in official public comment periods.

example, given that energy efficiency is a critical building block in transitioning heating systems to non-emitting sources, incentives and financial support for such work should align with the design and implementation of a Clean Heat Standard. The development of a Clean Heat Standard should also explore opportunities to advance the growth and training of a green workforce; we recommend that DEP host at least one public engagement session that focuses on issues relevant to labor and jobs.

Impacts on labor are just one of the criteria that should be used in evaluating the technologies that are eligible for credits under a Clean Heat Standard. As noted above, energy efficiency should be a core component of a Clean Heat Standard in light of its many benefits, including reducing energy costs, improving thermal comfort, and increasing resilience to extreme temperatures. Equitable deployment of electrification measures should also be a key objective of a Clean Heat Standard. To the extent various compliance mechanisms are incentivized via carve outs, higher credits or otherwise, co-benefits should be considered in addition to greenhouse gas emission reductions. Such co-benefits could include impacts on:

- Public health, such as reducing indoor air pollution by limiting emissions of criteria and hazardous air pollutants;
- Workforce development, such as employing local workers;
- Equity, such as access, impacts on energy burdens and avoiding gentrification;
- Resilience, such as adding cooling capacity to homes that do not have air conditioning; and
- Scalability, such as battery storage that serves a neighborhood rather than single building.

Addressing the challenges of climate change presents opportunities for advancing the well-being of our residents, communities and economies; a holistic approach to designing programs like a Clean Heat Standard will help identify and take advantage of such opportunities.

Given the breadth of issues that need to be addressed in developing a Clean Heat Standard, we suggest that DEP accept feedback in iterative stages so that more stakeholders can participate in the process.

Thank you for your consideration of these comments. We look forward to continuing to work with DEP to achieve our collective climate targets.

Sincerely,

Chief Mariama White-Hammond
Environment, Energy and Open Space, City of Boston

CLEAN FUELS ALLIANCE AMERICA COMMENTS ON MASSDEP STAKEHOLDER DISCUSSION DOCUMENT AND DISCUSSION DRAFT REGULATION FOR CLEAN HEAT STANDARD

April 28, 2023

Submitted by Stephen Dodge, Director of State Regulatory Affairs, Clean Fuels Alliance America

Thank you for the opportunity to offer comments on the Stakeholder Discussion Document and Discussion Draft Regulation for the proposed Clean Heat Standard.

Clean Fuels Alliance of America (Clean Fuels) is the industry's primary organization for technical, environmental, and quality assurance programs for biomass-based diesel (BMBD), and is the strongest voice for its advocacy, communications, and market development. CFAA represents the farmers, producers, distributors, and end-users of BMBD including biodiesel, Bioheat ® fuel, renewable diesel, and sustainable aviation fuel. Clean Fuels has been actively engaged with legislators and regulators in all the states that have LCFS-type programs already in place which include California, Oregon and Washington, as well as those states such as Vermont, New York and Maryland which are actively considering LCFS-like programs for either the transportation or heating sectors, or both.

While LCFS-type programs need to be tailored to meet the needs and demands of individual regions, there are certain premises that are necessary to ensure that such a market-based carbon reduction program is functional, cost-effective, manageable, transparent and provides regulatory certainty. DEP's straw proposal and discussion document raises several concerns.

LCFS MODELING

It is unclear from MassDEP's discussion document whether the GREET model will be utilized. See the below quote from page 6 of the CHS Stakeholder document:

> "One model for this, described in the CHS Appendix and currently being implemented as LCFS requirements for transportation fuels in California and Oregon, is to assign every emission reduction "pathway" a specific credit value, denominated in GHG emission reductions. This approach might be workable because Massachusetts could draw on California's work and simply "adopt" California's pathways. However, it might be possible to create a simpler system appropriate for Massachusetts' focus on electrification; …"

Life cycle assessment of greenhouse gas (GHG) emissions has been developed for analyzing the GHG impacts of products on an apples-to-apples basis and assist the public and policymakers in better understanding the breadth and magnitude of the impacts produced. It is the only way to get a complete picture of the environmental impacts of any technology. In particular, lifecycle GHG emissions have been used to compare systems operated on different fuels or energy options like electricity to consider the full impact of these systems and ensure that alternative energy options, whether fuel or electricity, do not inadvertently negatively impact overall GHG emissions, considering the global nature of climate change. Using a carbon intensity metric derived from the lifecycle emissions is particularly helpful in reducing GHG emissions cost effectively because it allows policymakers to assess emissions on a standard and unbiased basis,

such as per unit of energy, and compare those real emission reductions with the costs of the technologies under policy consideration.

Clean Fuels recommends MassDEP adopt a lifecycle emissions metric in its CHS program to ensure cost effective reductions for the whole sector with the certainty that only LCA can bring and to avoid unintended consequences that could come from MassDEP picking winners and losers. Without the use of LCA, MA could experience leakage where, rather than reducing the overall GHG emissions of its heating sector, the emissions could instead shift upstream. This is particularly relevant where emissions from electric generation are not zero, which will remain the case for multiple decades to come. While electrifying the heating sector may appear on its face to have reduced heating sector emissions to zero because there are no on-site emissions, in reality, the emissions shift upstream to the electric generators and can actually be worse in cold weather and during morning and/or evening peak grid load periods throughout the entire heating season. We understand that the Commonwealth is working to reduce the emissions from its electric generation sector, but unless and until that occurs, it is disingenuous to claim that electric heating is zero emissions. Furthermore, as electric heating adds to demand, it will require additional non-emitting generation to come online to confirm electric heating as a zero-emissions option for the heating sector.

Clean Fuels further recommends MassDEP use the current Argonne National Laboratory GREET model[1] in determining the lifecycle emissions associated with the energy sources for the heating sector. While GREET was originally designed for the transportation sector, the model still includes all energy sources relevant to the state's heating sector including diesel, biodiesel, renewable diesel, natural gas, electricity and propane. Furthermore, its use would streamline the process of developing lifecycle emissions metrics for each energy source because GREET applies appropriate system boundaries across all its fuels, which would make the metric comparable across sources. While we recommend MassDEP use GREET, we would caution you not to simply adopt CA's LCFS GREET pathways as referenced in the Discussion Draft. CA's lifecycle emissions metrics in the LCFS rely on *a version* of GREET that was modified in 2016 to reflect regulatory requirements and policy priorities of California. While those pathways have been adopted by other West Coast states, the differences in regulatory programs and policy priorities of the West Coast and Massachusetts are large enough that CA's version of GREET is likely inappropriate for Massachusetts' use. Furthermore, because CA modified the 2016 version of GREET, it does not incorporate the latest climate science or understanding of energy production processes as GREET has been updated annually by Argonne National Laboratory since then. As such, we would recommend MassDEP adopt the use of the most recent version of GREET in determining lifecycle emissions of its heating sector pathways so that MassDEP is always relying on the latest science and technological understandings in its program.

FEEDSTOCK NEUTRALITY

MassDEP has suggested that the CHS program mirror the state's flawed APS program which currently does not allow the use of crop-based waste feedstocks such as soy. This would make Massachusetts the only such LCFS-type program which disallows crop-based biomass waste

[1] https://greet.es.anl.gov

feedstocks – feedstocks which have met the federal criteria for advanced biofuels. California, Oregon and Washington's LCFS programs as well as New York, Connecticut and Rhode Island's Bioheat ® fuel mandates, and the recently passed CHS legislation in Vermont, do not limit waste feedstocks.

Massachusetts should take a technology neutral approach to any CHS program. Biodiesel feedstocks that achieve lifecycle greenhouse gas (GHG) emissions reductions relative to petroleum should be allowed in the CHS. The market, through science-based metrics, should be able to determine the feedstocks and fuels that provide GHG emissions reductions – including significant indirect emissions – at the lowest cost to society. Setting wholesale limits or caps on biodiesel feedstocks will arbitrarily restrict the state from achieving GHG emissions reductions at the lowest possible cost and maximizing total benefits. Concerns of indirect impacts of biodiesel use in the state should be addressed through market-based and science-based mechanisms to incentivize behavior that reduces GHG emissions. The U.S. Renewable Fuel Standard (RFS), which sets the volume of biomass-based diesel used in the United States, already has requirements for feedstocks to meet a 50% emissions reduction threshold and ensure that land use is not expanding.

Allowing for all eligible feedstocks will help ensure that supplies of biomass-based diesel are sufficient to not only meet the needs of the program, but to immediately reduce carbon emissions – an urgent need cited by the most recent United Nations IPCC reports. In addition, limiting feedstocks has an adverse effect on the communities that MassDEP wants to protect the most – disadvantaged EJ and LMI communities.

Limiting eligible feedstocks is short-sighted. Massachusetts will not be setting the overall production of biofuels in the marketplace with any new rule as the RFS (Renewable Fuel Standard) is the overall driver of production in the US. By banning crop-based biofuels, the state would be limiting the options for biofuels within the state, which will drive up fuel costs and/or lead to a lack of supply of biofuels within the state as producers avoid Massachusetts (since they could go next door to VT or to NY with those same volumes that do not have feedstock restrictions). The end result would be higher costs for all consumers which would be particularly burdensome to LMI communities, as those costs take up more of their paycheck than for higher wage earners, as well as continuing environmental injustice due to the continuing use of fossil fuels.

The experience in California is worth noting. Argus has created an analysis for renewable diesel (R100) pricing that is split out by feedstock, breaking prices into four buckets within the state of California: corn oil-based, soybean oil-based, tallow-based, and used cooking oil-based. When comparing the prices of R100 by feedstock that is delivered to the state of California over the past year, it is readily apparent that soybean oil-based R100 is much cheaper than using other feedstocks. For example:

- Since May 2022, daily prices for distillers corn oil-based R100 have been, on average, 26 cpg more than soy oil-based R100.

- Since May 2022, daily prices for tallow-based R100 have been, on average, 22 cpg more than soy oil-based R100.
- Since May 2022, daily prices for used cooking oil-based R100 have been, on average, 35 cpg more than soy oil-based R100.

While these are significantly higher prices per gallon within the state of California, it is safe to assume that this would carry over into other similar LCFS/CHS programs that are similarly structured. As with California, Massachusetts would be much better served, from a markets standpoint, to use a credit-based system that incentivizes all feedstocks that fit market conditions within the state, as producers and distributors will respond to price signals to meet CHS requirements using lower CI feedstocks.

3 PERCENT CARVEOUT FOR HEAT PUMPS

Page 4 of the Discussion Document states: "…heating energy suppliers might also be required to demonstrate the conversion of approximately 3% of their customers to electric heat each year…"

This provision, which would be unique to any LCFS-type program either in place or proposed, does not make sense when applied to anyone other than those already in the business of installing electric heat pumps. If Massachusetts customers are slow to adopt heat pumps, then a mandate for liquid fuel dealers to sell them would likely not work either since customer resistance to (even subsidized) high capital costs would remain high. This concept is contrary to the hallmark of any LCFS-type program – its free-market and science-based approach. This carve-out and ensuing forced retirement of liquid fuel dealers - when many if not most of those affected businesses have been built over generations entirely around providing liquid or gaseous fuels - is free market interference of the highest order. It would require a whole conversion of mom-and-pop businesses (business that have developed, in many cases, a unique personal relationship with their customers, unlike major utilities) that have been built over generations and have helped warm Massachusetts' residents through cold winters for many decades. While many such dealers are already providing heat pump installations and services to their customers, for many, forcing them into the heat pump business is an entirely different business model. Such a provision is not an incremental requirement to use the best available burner and fuel technology, but rather a requirement to use a different technology which many fuel distributors are not equipped to implement. It is neither technology neutral nor performance based, so it's a Clean Heat Standard/LCFS in name only. It would be akin to requiring an automobile dealer to also sell electric boats.

While the Discussion Document also notes: "Note that compliance with emission reduction and electrification requirements would be demonstrated using credits, so energy suppliers would *not necessarily* (our italics) have to achieve progress among their own customers," the state would essentially be forcing businesses to close by gradually eliminating market share, when a low-carbon/drop-in fuel substitute is readily available that is cost-effective and can reduce carbon and other co-pollutants immediately.

SUPPLIES AND FEEDSTOCK AVAILABILITY

While the discussion document does not address biomass-based diesel (BMBD) supplies, we understand that supplies are a concern. We have included comments below on feedstock availability. It should be noted that since biomass-based diesel is made from waste feedstocks only (including soy oil which a waste product of the soy bean), any food versus fuel concerns do not apply to BMBD, unlike other biofuels such as ethanol. It is important to understand that the relationship is food and fuel with BMBD.

Soy and Canola

LMC International Ltd. investigated current features of the North American feedstock markets to evaluate how they will evolve and the potential for significantly increasing supply of biodiesel feedstocks of North American origin (study is attached). LMC is an independent consulting firm specializing in the economic and market analysis of crops and agro-industrial products, such as biofuels, since 1980. The LMC analysis was focused on short-term increases of feedstock supplies (2021 to 2025) in North America only. Therefore, it is important to note that additional feedstock supplies available via global trade are not part of the analysis. In addition, LMC notes the analysis does not attempt to quantify additional production of oilseeds such as soybeans or canola due to improvements in yield technology. LMC concludes, "… additional supplies of lipid feedstocks of North American origin … raises the supply of suitable BBD feedstocks from 41.1 to 55 billion lbs., a total increase of 14 billion lbs. in the period 2021-2025." Up to 1.9 billion additional gallons of biodiesel could be generated from the additional feedstock supplies available during this time frame.

Without consideration of increased production due to yield improvements, much of the additional supplies of soybean oil in the United States will be a result of new oilseed processing capacity. As corroborated by the LMC report, oilseed processing capacity will increase significantly over the next 3 years and a similar trend is expected in Canada with canola processing capabilities. US soybean crush is anticipated to grow to 2.63 billion bushels by 2025; supplied by a combination of increased production in the US (boosted by higher yields) and some shifts away from lower value export markets. Overall supplies are a combination of increased processing and a long-term trend of higher oil output per bushel. Overall, LMC projects soybean oil production in the US to increase to 30.8 billion pounds by 2025.

Although Canadian canola oil supplies will increase significantly by 2024 (due primarily to increased processing capacity), additional demand will also be generated from that country's national Clean Fuel Standard set to be implemented. The LMC analysis factors in this additional demand and forecasts up to 5.8 billion pounds of additional supplies available to the US market by 2025.

Animal Fats

Animal fats are produced as a by-product from the processing of livestock for meat and, as a result, the output of animal fats is principally determined by the level of animal slaughter which in turn is linked with increased demand for animal protein diets and influenced by per capita

incomes in developing countries. As the global consumption of meat has expanded, the production of animal fats has also increased. Although both edible and inedible grades of animal fats are traded, inedible fats such as choice white grease, inedible tallow, and poultry fat are the primary feedstocks for biodiesel and RHD production.

LMC projects animal fats to reflect slow growth and stable production noting, "… the slow pace of growth in meat consumption [in the US] and minimal feedback from animal fat prices to rendering activity." Up to 56 million additional gallons of biodiesel could be generated from the new supplies of animal fat supplies in the US available during this time frame.

Although increases are projected to be stable, changing market conditions could create new expansion opportunities in both US livestock production and the generation of additional animal fat supplies. As previously noted, oilseed processing capacity will expand significantly over the next four years. These operations will increase domestic soybean meal supplies and create competitive operating conditions for US livestock operations. Recent new announcements support the potential for new animal processing capacity which would generate additional US animal fat supplies. Two new plants have been announced in Nebraska and Missouri, would increase US slaughtering capacity by an estimated additional 3% once operational.

DCO

Distillers corn oil (DCO), a by-product of the dry milling corn ethanol industry, is a prime example of technology that did not exist prior to growth of the biomass-based diesel market. One decade ago, only 300 million pounds of DCO were utilized by biomass-based diesel producers. Although DCO supplies were impacted by reduced gasoline consumption due to Covid-19 in 2020, production rebounded in 2021. According to data from the USDA Grain Crushing Report[2], 3.96 billion pounds of DCO were produced in 2021. DCO production continues to grow; in the first half of 2022, 2.1 billion pounds of DCO were produced, up 235 million pounds, or 13%, over the first half of 2021.

Additionally, DCO yields (pounds of lipid extracted per bushel of corn) continued to improve, increasing by 4% over the same period. LMC projects nearly 4.5 billion pounds of DCO production in 2025, with the 500-million-pound addition coming from the continued adoption of new technologies that improve yields. In 2021, according to the USDA, yields were approximately 0.84 pounds per bushel when including all ethanol production. However, accounting for the fact that approximately 94% of ethanol production recovers DCO (according to industry sources), yields are calculated to be approximately 0.9 pounds per bushel.

Yields are expected to increase with technological improvements in oil extraction. For example, Green Plains Inc. reported renewable corn oil production at yields of 1.4 pound per bushel (see attached document). If 2021 ethanol production yielded 1.4 pounds per bushel, there would be approximately 2.35 billion pounds of additional DCO available, or 300 million gallons of BBD.

[2] See https://usda.library.cornell.edu/concern/publications/n583xt96p.

Policy incentives could also drive innovation to increase the lipid content in corn, which would further increase corn oil supplies.

Other avenues for growth in ethanol production, such as sustainable aviation fuel (SAF) pathways and allowance of higher ethanol blends with motor gasoline, could free up additional corn oil supplies. Ethanol-to-jet (ETJ) pathways have been identified as an important piece of meeting the Biden Administration's SAF Grand Challenge, which calls for 3 billion gallons of SAF by 2030.[3] Relaxing of the E10 blendwall with increased allowance of mid-level blends such as E15 would increase DCO supplies further. Assuming current DCO yields of 0.9 pounds per bushel, nationwide adoption of E15 could increase DCO production by approximately one billion pounds. Additional channels for increased ethanol production, such as increased export opportunities or increased lipid levels in corn, would increase DCO supplies further. The American Petroleum Institute recently joined the ethanol industry in their support for nationwide allowance of E15.[4]

Winter Annual Oilseeds

Technology neutral programs such as the California LCFS incentivize research and investments and can help advance new technology, including oilseed crops. This is validated not only through investments in existing oilseeds to increase yield and/or lipid content but also through recent investment in winter annual oilseed crops which upon commercialization will result in significant expansion of vegetable oil supplies. Geographically dispersed throughout the US, companies are working to commercialize camelina, CoverCress™, and brassica carinata into the rotations of US agriculture. Grown as winter annuals, these crops have the potential to provide the ecosystem service benefits of a cover crop yet expand vegetable oil supplies. Such benefits include reduced winter soil erosion as well as positive soil amendments via sub-subsurface fixation of nutrients. Interest in the commercial prospects of these crops continue to grow as evidenced by investment and partnerships of mid-stream and downstream companies such as Bunge, CHS, Chevron, Exxon Mobil, and BP. Based on current market plans, these crops could add more than one billion gallons of additional vegetable oil into the supply chain by 2030.

Thank you for the opportunity to offer these comments and suggestions to the draft proposal. Clean Fuels is based in Jefferson City, Missouri with an office in Wilmington, Massachusetts. Floyd Vergara, Director of Government Affairs for Clean Fuels, is a 32-year veteran of CARB and was one of the principal designers of California's Low Carbon Fuel Standard. Floyd and our technical staff are always available to provide technical information to MassDEP and other state agency staff. My contact information is below:

Stephen Dodge
Director of State Regulatory Affairs
sdodge@cleanfuels.org
781-361-0156

[3] See https://www.energy.gov/eere/bioenergy/articles/sustainable-aviation-fuels-low-carbon-ethanol-production.
[4] See https://www.reuters.com/article/usa-biofuels-e15-idAFL1N3263M8.

The Outlook for Increased Availability & Supply of Sustainable Lipid Feedstocks in the U.S. to 2025

Report for:

Clean Fuels Alliance America
Washington, DC

February 2022

LMC International

Oxford

4th Floor, Clarendon House
52 Cornmarket Street
Oxford OX1 3HJ

t: +44 1865 791737
f: +44 1865 791739

info@lmc.co.uk

New York

441 Lexington Avenue, Floor 2
New York, NY 10017, USA

t: +1 (212) 586-2427

info@lmc-ny.com

Kuala Lumpur

SO-30-8, Menara 1
No.3 Jalan Bangsar, KL Eco City
59200 Kuala Lumpur, Malaysia

t: + 60 3 2202 1414

info@lmc-kl.com

www.lmc.co.uk

OS89/osc111n

Insights for agribusiness

Specialist data and analysis for commercial decision-making

- Sugar & Sweeteners
- Oils & Fats
- Starch & Fermentation
- Ethanol
- Biodiesel
- Oleochemicals
- Cocoa
- Coffee
- Natural & Synthetic Rubbers
- Proteins
- Agriculture
- Other Commodities

www.lmc.co.uk

Table of Contents

Contents

List of Tables

List of Diagrams

Executive Summary

LMC International investigated current features of the North American feedstock markets to evaluate how they will evolve and the potential for significantly increasing supply of bio-based diesel (BBD) feedstocks of North American origin. BBD as defined in the Renewable Fuel Standard includes both biodiesel (BD), such as soybean methyl ester, and renewable diesel (RD), whose properties are similar to diesel derived from petroleum.

The features that we have examined include:

- The growth in soybean oil output from the new U.S. crushing capacities
- The growth in canola oil availability from Canadian crushing capacities
- The scope for crushing U.S. soybeans in Mexico and sending the soybean oil to the U.S.
- The growth in distillers' corn oil production
- The supply of animal fats
- The supply of used cooking oil (UCO)
- Minor oilseed crops

Based on research and analysis of past trends and drawing on LMC's extensive expertise in agricultural raw materials, we forecast the likely impact of these factors on supply to 2025.

These forecasts of additional supply are summarized in the following table.

Table S1: The potential growth in North American biodiesel feedstock supply, 2021-2025

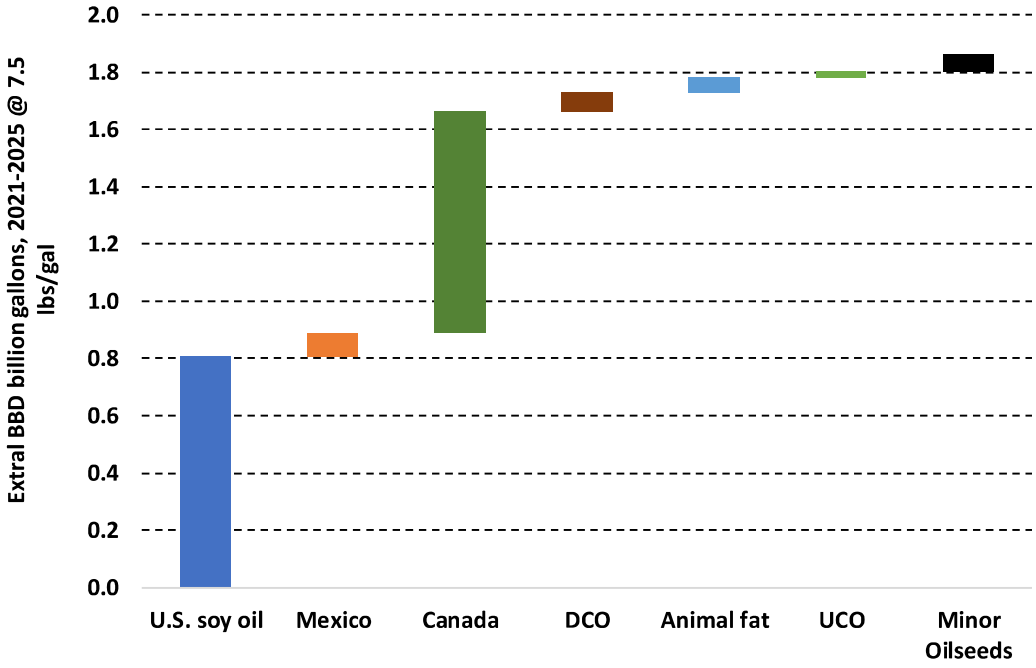
	N. American feedstock supply		Supply growth	BBD growth 2021-2025	
	Million lbs.	Million lbs.	Million lbs.	Million gallons	
	2021	2025	2021-2025	at 8.0 lbs./gal	at 7.5 lbs./gal
Domestic soybean oil	24,775	30,837	6,061	758	808
Mexican sales to U.S.	0	615	615	77	82
Canadian canola oil	0	5,772	5,772	721	770
Distillers' corn oil	3,980	4,474	494	62	66
Animal fats	10,327	10,750	424	53	56
Used cooking oil	1,889	2,044	156	19	21
Minor oilseed crops	84	555	471	59	63
Total	**41,054**	**55,047**	**13,992**	**1,749**	**1,866**

Note: It is assumed that between 7.5 and 8.0 lbs. of oils and fats are used to make one gallon of BBD. This reflects the differing feedstock requirement for BD and RD.

- **Combining the additional supplies of lipid feedstocks of North American origin outlined above raises the supply of suitable BBD feedstocks from 41.1 to 55.0 billion lbs., a total increase of 14.0 billion lbs. in the period 2021-2025.**
- **Converting this growth into gallons of BBD at 7.5-8.0 lbs. per gallon, this would provide the feedstock for between 1.749 and 1.866 billion additional gallons of BBD in 2021-2025, with the contribution of different feedstocks described in Table S1.**

Diagram S1 illustrates the potential increase in BBD supply by feedstock over this period. It highlights the major role of the contributions from the crushing of U.S. soybeans and Canadian canola.

Diagram S1: Extra potential supplies of BBD by feedstock, 2021-2025, at 7.5 lbs./gallon



Growth in North American biomass-based diesel feedstock supplies to 2025

Objectives of this study

The U.S. biofuel market is currently adapting to the growth in U.S. Renewable Fuel Standard (RFS) mandates and in the demand for renewable fuels under individual state initiatives. Such initiatives include state-specific biomass-based diesel (BBD) blending mandates such as is in effect in Minnesota and individual states' low carbon fuel standards, among which California's is generating the biggest increases in its demand for low carbon fuels.

Corn ethanol has emerged as the largest single source of biofuel in the U.S., but the targets established in the RFS and the limits on blending percentages mean that much of the future expansion in domestic biofuel supply will be as BBD, combining both biodiesel, of which the best known is soybean methyl ester, and renewable diesel, which is also known as hydro-treated vegetable oil.

This study estimates the growth in the availability of approved feedstocks for BBD in the period between 2021 and 2025. Because the focus is on supplies permitted for use in the U.S., the wider global picture is not discussed. In practice, it is expected that there will be significant increases in the output of oils and fats outside the U.S., but they are not considered here.

The report is divided into the following sections:

1. The growth in the production of locally produced soybean and canola oil in the U.S. and Canada, driven by expansion in crushing capacities. (*It should be noted that this analysis does not quantify the additional production of soybeans or canola due to enhanced yields, but it does include an allowance for higher output of oil per bushel crushed. Note also that we consider only these oils when they are obtained from locally grown oilseeds. Soybean oil imports from Argentina or Brazil, for example, face a 19.1% non-MFN import tariff which would make them uncompetitive with North American oil, even if these imported oils meet EPA pathway criteria.*)

2. The scope for crushing U.S. grown soybeans in northern Mexico and shipping the resulting oil to the U.S. for processing into BBD, while using the associated soybean meal to reduce Mexico's supply deficit in this meal.

3. The increased output of distillers' corn oil obtained from the extraction of oil from the distillers' dried grains produced at U.S. corn dry milling plants.

4. Higher supplies of animal fats, such as inedible and technical grade tallows and choice white grease, from the U.S. rendering industry.

5. Greater domestic availability of used cooking oil and recycled fats and greases.

6. Expansion in the areas planted to the minor oilseed crops, camelina, carinata and CoverCress™, of which currently only camelina has EPA approval.

7. **Conclusions, with overall estimates of the increased supply of approved BBD feedstocks between 2021 and 2025.**

Soybean and canola oil – new supplies from North America

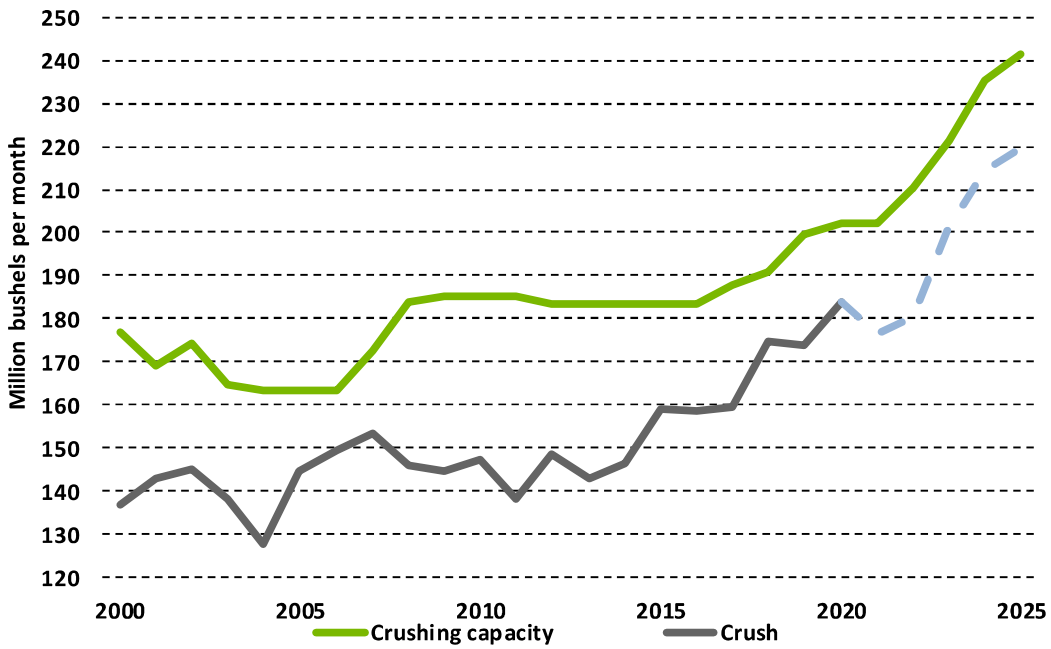
One of the features of the past year has been a wave of announcements about new crushing capacities, notably for soybeans in the U.S. and for canola in Canada.

New crushing capacities

U.S.: This new capacity is already contracted or close to being contracted by all major processors for the period until 2024, some in partnership with petroleum companies. In view of the momentum for expansions at existing plants, we think it is a reasonable assumption that further new capacity, from yet unconfirmed projects that have been announced without a firm date, will be installed in 2025.

Diagram 1 plots installed capacities and total U.S. soybean crush, using USDA NASS data. In 2020, capacity utilization was just over 91%, which was also the peak achieved in 2006 and 2018 and is a realistic maximum allowing for normal downtime. The forecasts of crushing activity, indicated by the dashed line, assume that with new plants coming into operation the industry-wide average utilization rate settles at 91% in 2025.

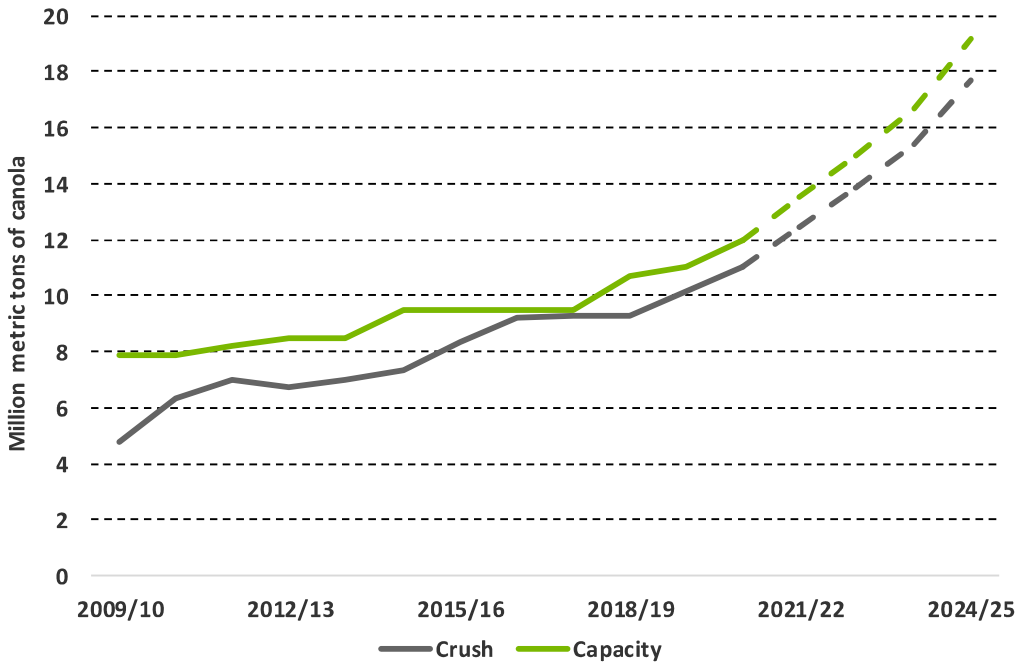
Diagram 1: U.S. soybean crushing capacity and projected crush, million bushels per month



Canada: A similar era of rapid growth in Canadian canola crushing capacity is under way. Diagram 2 plots the evolution of this capacity, all of which has already been announced, and the associated crush. For the historical data we rely on Canadian Canola Council statistics, which imply that the average capacity utilization in 2015/16-2020/21 was 92.2%.

In these projections, we assume that the actual crush is stable at this level of capacity utilization in 2021-2025.

Diagram 2: Canadian canola crushing capacity and projected crush, million metric tons



The growth in soybean oil output from new U.S. crushing capacities

The increase in U.S. soybean oil production will follow the additional levels of domestic soybean crushing, driven by the announcements of investment in new capacity.

At present, the U.S. exports more than half of its whole soybeans. Increased future crush at the assumed capacity utilization levels can be supplied in part from increased soybean output, boosted by higher yields, and also by shifting some whole soybean volumes from export channels to domestic crush until those volumes can be replaced by domestic production. We project that:

The U.S. soybean crush will grow from 2,131 to 2,637 million bushels in 2021-2025.

This is a 23.7% increase from 58.0 to 71.8 million metric tons in the five-year period, in part because of a recovery from the depressed Covid-affected level of crush in 2021.

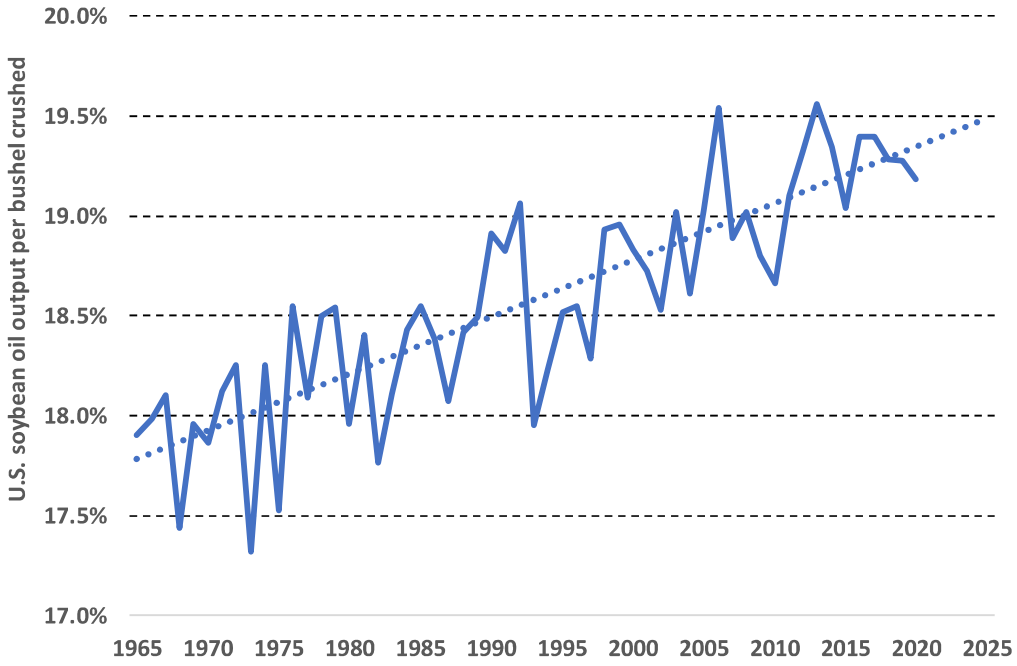
That is not the only cause of the increase in soybean oil production. Diagram 3 reveals that oil output per bushel has risen steadily over a very long period. Applying the underlying trend in oil output per bushel, the growth in the crushing of U.S. soybeans implies that:

U.S. soybean oil total output will grow from 24.8 to 30.8 billion pounds in 2021-2025.

This is a 24.5% overall increase from 11.2 to 14.0 million metric tons in this period.

If one applies a figure of 7.5-8.0 lbs. of soybean oil to produce a gallon of BBD, this means that the increase in U.S. soybean oil production would be able to add between 757 and 807 million gallons of soybean-derived BBD to U.S. supply in 2021-2025.

Diagram 3: U.S. soybean oil production as a percentage of the soybean crush



There may be a further boost to U.S. soybean oil production from indications that higher soybean oil prices lead crushers to push a bit harder to extract more oil from their beans.

We have drawn upon data from two different and independent sources. One is the annual series of USDA NASS crushing statistics that underlie Diagram 3. The other is separate analysis published each year by USSEC (the U.S. Soybean Export Council) and USB (United Soybean Board) of the oil content of the soybeans produced by U.S. farmers each year.

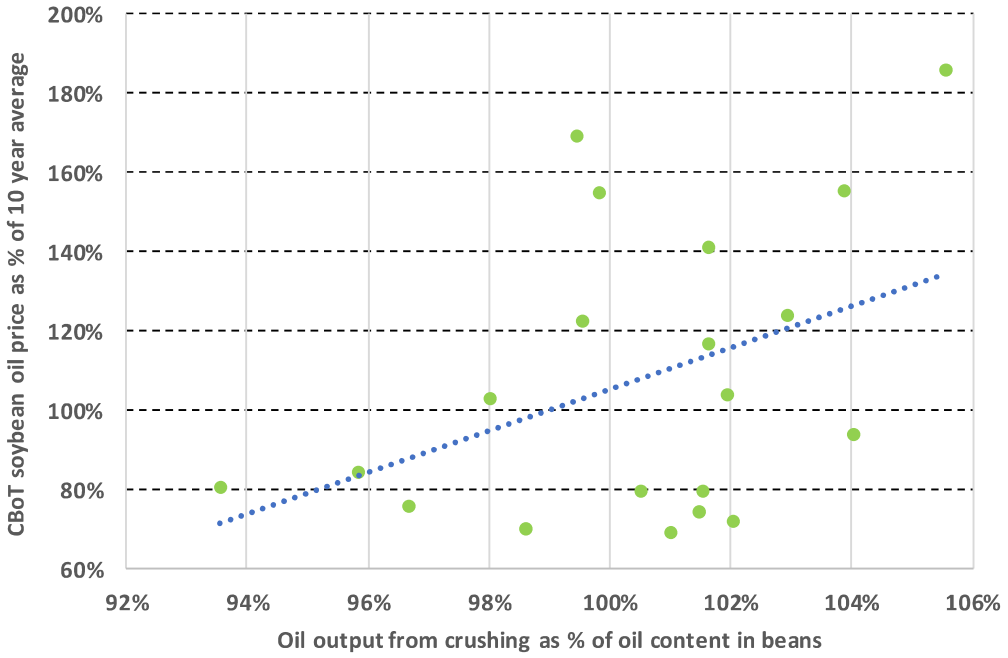
We plot in Diagram 3 the oil content of soybeans in the annual Soybean Quality Surveys with the oil obtained per bushel of beans that are crushed. Higher soybean oil prices reward crushers for squeezing more oil from the beans they process. Inevitably, higher oil extraction is tied to a lower meal content, which is a long-run trend, but the incentive to extract oil rises as the oil becomes more valuable and we expect the growth in BBD demand to underpin this desire to maximize the oil output from the beans crushed.

Because there has been an underlying upward trend in soybean oil prices over time, we have calculated each year's oil price as a percentage of the average price over the previous ten years. Diagram 4 plots these price percentages against the ratio of total U.S. soybean oil output to the oil content of the soybeans crushed domestically. It is a scatter diagram with a linear trend fitted to the data points over the past 20 years. We conclude that:

There is some evidence that higher soybean oil prices in relation to past average price levels induce crushers to extract more oil from the beans that they crush.

If soybean oil prices remain strong in the next few years, there will therefore be some upside to the soybean oil production forecasts summarized above. However, we have been conservative and have not factored this into the projections outlined above.

Diagram 4: Soybean oil output from crushing as a % of the oil content in soybeans



The growth in canola oil availability from Canadian crushing capacities

Diagram 2 reveals that the wave of new investments in Canadian canola crushing capacities is very similar to the picture in the U.S. Diagram 5 plots Canadian canola crop oil content, with some evidence of the same incentives that were seen in Diagram 4 for U.S. soybeans, whereby crushers work somewhat harder to extract oil when the oil prices are higher.

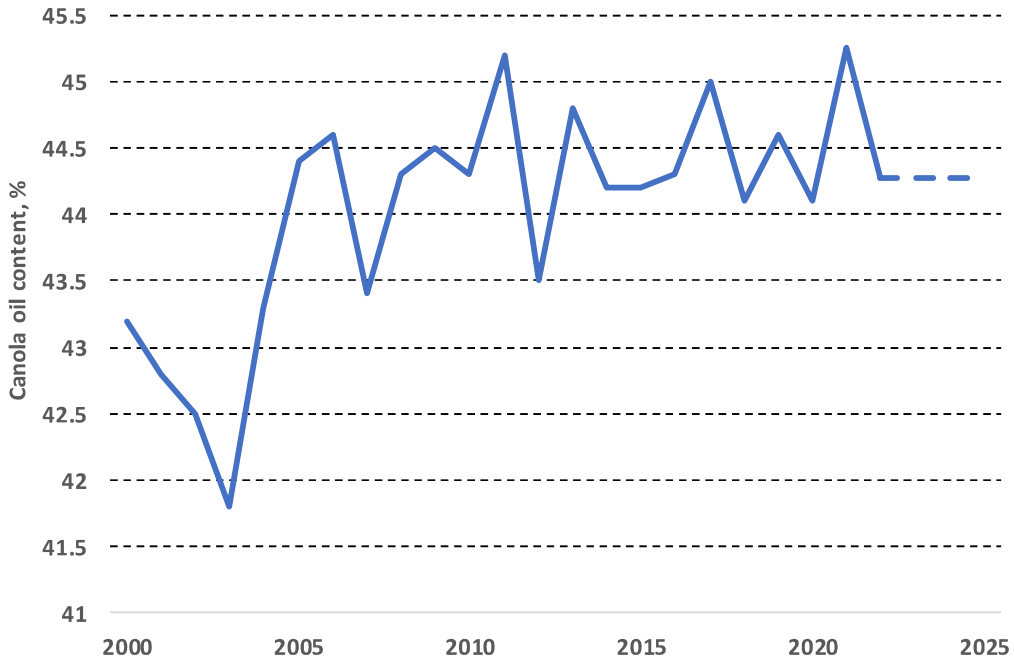
We combine trends in Diagram 5 with crushing forecasts in Diagram 2 to derive Diagram 6, which indicates the total canola oil output implied by the growth in crushing capacities. Increases in Canadian canola oil output do not depend on the crop each year because its seed exports are large and a rising crush can be supplied by reducing these exports.

Canada favors its own canola oil in biofuels. Advanced Biofuels Canada predicts demand for canola oil for biofuel will grow from 194,000 to 384,000 metric tons in 2020/21-2024/25. We assume that local canola oil is also used to maintain sales to export markets and to the domestic non-biofuel sector at 2020/21 levels. After meeting this demand, U.S. biofuels producers should be able to secure all remaining growth in canola oil supply, as indicated in Diagram 6, benefiting from the expectation of EPA approval for a RD pathway for Canadian canola oil by 2025.

Canadian canola oil output will grow from 11.0 billion to 17.1 billion lbs. (5.0 to 7.8 million metric tons) in 2021-2025. Canada's BBD sector growth will absorb 0.4 billion lbs. of this new supply, but all other growth in output is available for the U.S. market. The volume available for U.S. BBD rises from zero in 2021 to 5.8 billion lbs. in 2025, following the EPA's approval of a Canadian canola oil pathway as a feedstock in RD.

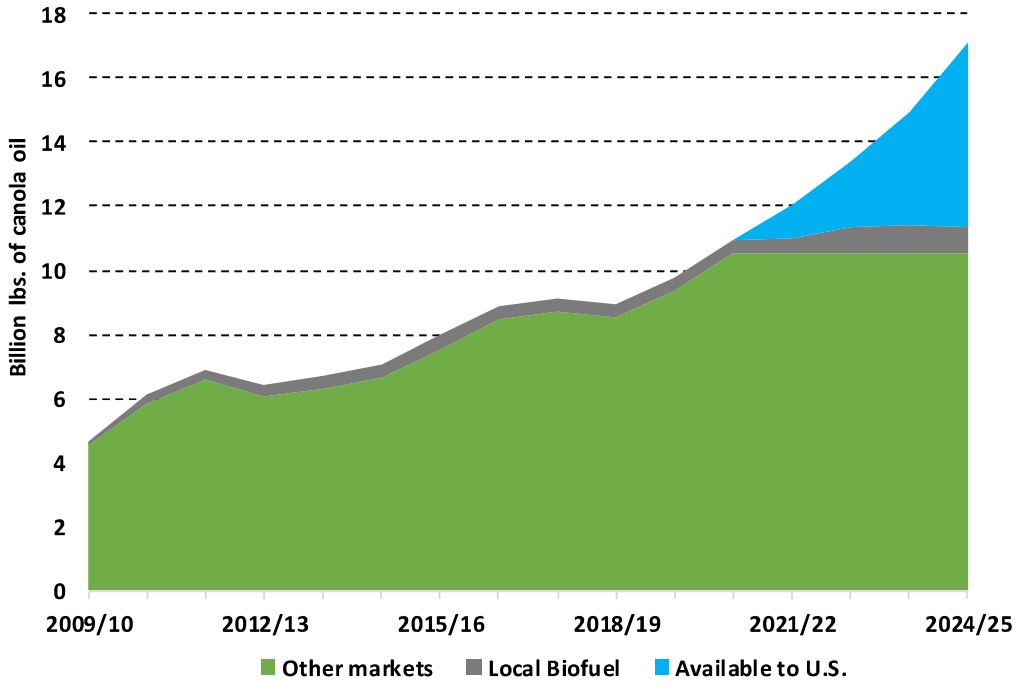
At 7.5-8.0 lbs. of oil per gallon of BBD, the increase in Canada's canola oil supply would contribute between 721 and 770 million gallons to U.S. BBD production in 2021-2025.

Diagram 5: Canadian percentage oil content in canola output, 2000-2020 with forecasts



Source: Canadian Grain Commission.

Diagram 6: Canadian canola oil output and its actual and potential end-uses, 2009/10 – 2024/25



Sources: Advanced Biofuels Canada; Canadian Grain Commission.

The scope for crushing U.S. beans in Mexico and sending oil to the U.S.

The demand for a feedstock approved by the EPA for biofuels means that there will be pressure to maximize the available capacity to provide such feedstocks. One CARB-approved soybean BBD supplier, BIOX, produces its BBD in Canada from U.S.-derived soybean oil. With approval from the EPA regarding the crushing of U.S. origin soybeans for the supply of the oil to the U.S., a similar model could work for Mexican soybean crushers.

Mexico has spare crushing capacity. The USDA FAS Mexico Oilseeds and Products Annual GAIN report April 2020 stated "*Reportedly, crushers are operating at 65.5% of capacity on average. Industry sources stated that the total capacity of Mexican crushing industry is nearly 11.0 MMT. Total crush in 2019/20 was estimated to be 7,534,000 tonnes of seeds".*

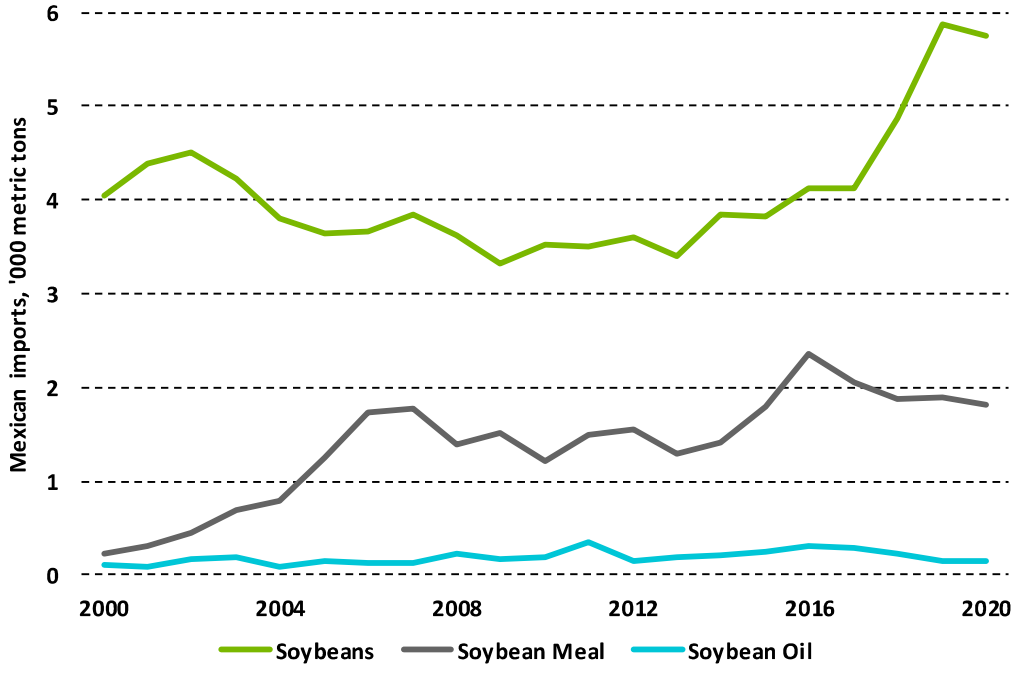
Therefore, U.S. soybeans could be sent to Mexico for crushing, with the resulting meal remaining in Mexico, while the oil could be transported to the U.S. to process into BBD.

We estimated the Carbon Intensity of this soybean oil, allowing for additional freight from the U.S. to Mexico and on to California. Its valuation in the Californian LCFS when processed into BBD at a well-placed location was 61.5. At the recent carbon price of over $200 per metric ton, it would be profitable for some Mexican crushers linked with the U.S. rail network to use spare crush capacity to supply soybean oil to the LCFS market.

Potential volumes of oil

Mexico is only a small soybean producer, but it is a major soybean importer. It also imports large amounts of soybean meal. However, soybean oil imports are low, as Diagram 7 reveals.

Diagram 7: Mexican imports of soybeans and soybean meal and oil, '000 metric tons



The imbalance between meal and oil in the Mexican market is highlighted by Diagram 8, where volumes are expressed in terms of soybean equivalents. These are the quantities of soybeans that would need to be crushed to yield the volumes of meal or of oil imported into Mexico. The conversions we apply in this case are 79% for meal (so that meal imports are divided by 0.79 to derive the soybean equivalent of the meal imports) and 18.5% for oil (i.e., dividing the oil imports by 0.185 to estimate its soybean equivalent tonnage).

Diagram 8: Mexican imports soybean equivalent, '000 metric tons

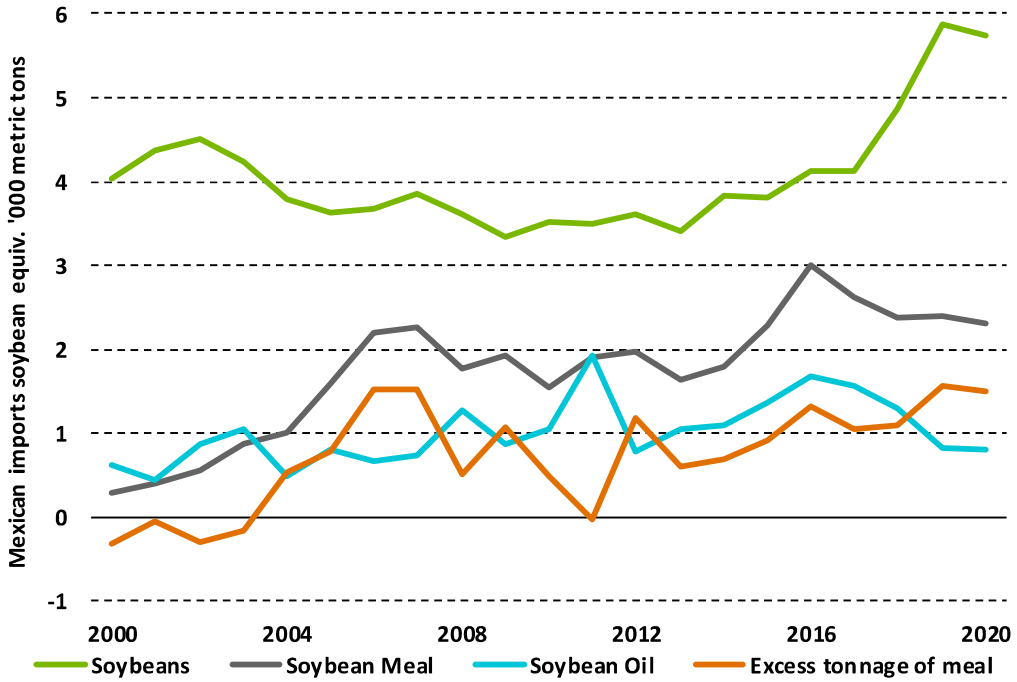


Diagram 8 demonstrates the imbalance. Recent imports of soybean meal have ranged between 2.5 and 3.0 million metric tons of soybean equivalent, while 2019 and 2020 imports of oil *were* less than 1.0 million metric tons of soybean equivalent. We have added a curve to this diagram to measure the imbalance, which we entitle the excess tonnage of meal. This has recently exceeded 1.5 million metric tons in soybean equivalent (55 million bushels of soybeans).

The main uncertainty about the scope for crushing U.S. soybeans in Mexico to ship oil to the U.S. is that BBD producers prefer to use refined rather than crude soybean oil and Mexico does not have much unused refinery capacity in the locations with the best logistics for shipments to the U.S.

The analysis suggests that 55 million bushels of soybeans could be crushed in Mexico to reduce its soybean meal imports and release the oil derived from these U.S. soybeans for export to the U.S. without unduly straining the capacity of Mexican crushers.

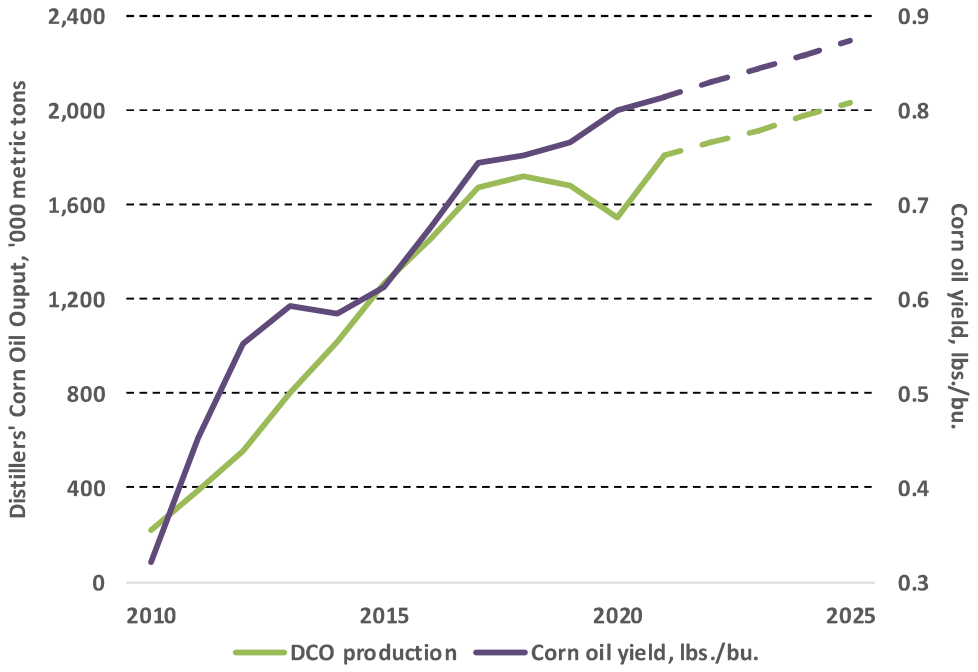
The oil available to U.S. biofuel producers would be 615 million lbs. (280,000 metric tons).

At 7.5-8.0 lbs. of soybean oil per gallon, this would provide the feedstock for an increase in BBD supply of between 77 and 82 million gallons in 2021-2025.

The growth in distillers' corn oil production

Among sources of corn oil, at present only distillers' corn oil, from corn dry milling, may be used as a feedstock under the Renewable Fuel Standard. Diagram 9 plots past trends and forecasts of DCO extraction rates/bushel in corn dry milling and the resulting DCO output.

Diagram 9: Distillers' corn oil extraction rates per bushel in U.S. dry milling



The extraction rate is expected to continue rising gently as a result of the gradual adoption of three new technologies to boost oil extraction in pounds per bushel of corn. The most widely adopted, although generating the smallest increase in extraction rates, is Edeniq Intellulose technology, which boosts the DCO output per bushel by 14%.

The ICM (front end) separation process technology raises distillers' corn oil extraction by 20% per bushel; and the D3 MAX (back end) technology, which converts corn fiber and residual starch into ethanol, adds an impressive 65% to the DCO output per bushel.

The volume of corn processed into ethanol is not projected to grow much; indeed, it is not forecast to regain its 2018 level until 2024. DCO output growth depends on higher DCO extraction as new technologies are introduced. In view of the high prices paid for DCO, this is not an unrealistic expectation. The overall situation may be summarized as:

The supply of DCO fell to 3.41 billion lbs. (1.68 million metric tons) in 2020 due to COVID.

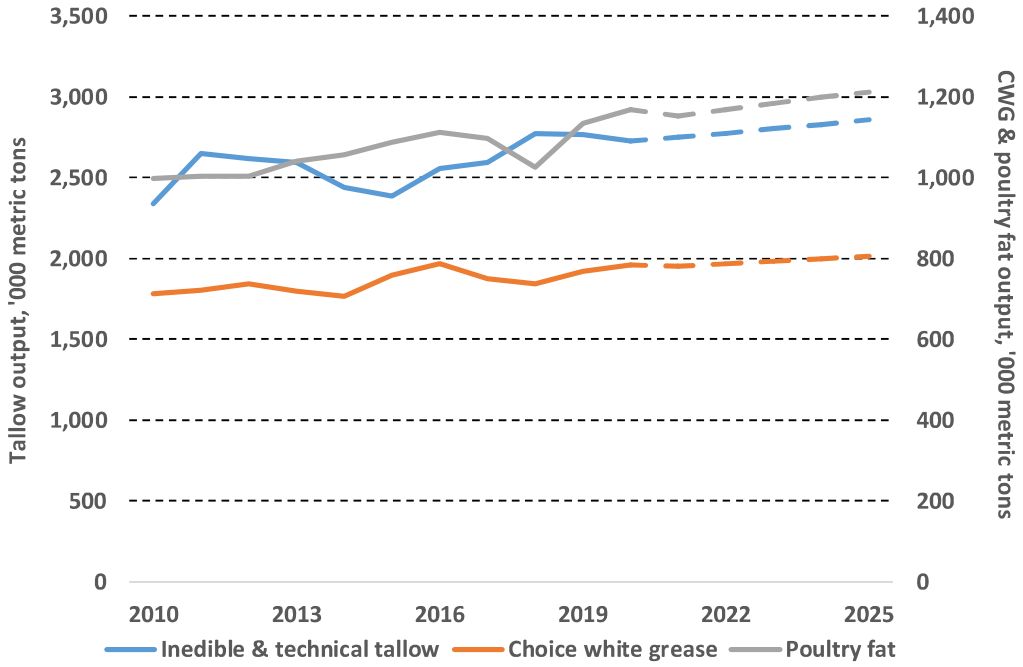
It should recover to 3.98 billion lbs. (1.80 million metric tons) in 2021 and then grow to 4.48 billion lbs. (2.03 million metric tons) by 2025, an increase of 500 million lbs.

At 7.5-8.0 lbs. of DCO per gallon of BBD, this would provide the feedstock for between 63 and 67 million additional gallons of BBD in 2021-2025.

The supply of animal fats

Supply of the three main animal fats from rendering is relatively stable, reflecting both the comparatively slow pace of growth in meat consumption and the minimal feedback from animal fat prices to rendering activity. Diagram 10 depicts the growth in the three main sources of such fats with projections to 2025.

Diagram 10: Past and projected growth in U.S. animal fat supply



The rendering sector is a relatively stable sector with its growth closely linked to the increase in meat consumption.

The main risk in the forecasts underlying Diagram 10 is a rapid adoption of meat-free eating habits. However, there are few signs that such a change will happen rapidly or indeed that there will be shift away from meat consumption in the next four years.

Adding together the growth in these three main sources of animal fats from rendering, between 2021 and 2025 the overall increase in U.S. animal fat output is projected to be 192,000 metric tons, or 424 million lbs.

This growth in overall animal fat availability in 2021-2025 is projected to be divided between these three main sources of animal fats as follows:

Inedible and technical tallow would have the lion's share with growth of 239 million lbs.; poultry fat would be the second largest source of higher animal fat supply, rising 129 million lbs.; while choice white grease obtained from processing hogs would increase by 56 million lbs. over the four years.

If we convert this into BBD at 7.5-8.0 lbs. per gallon, this would provide the feedstock for between 53 and 56 million additional gallons of BBD in 2021-2025.

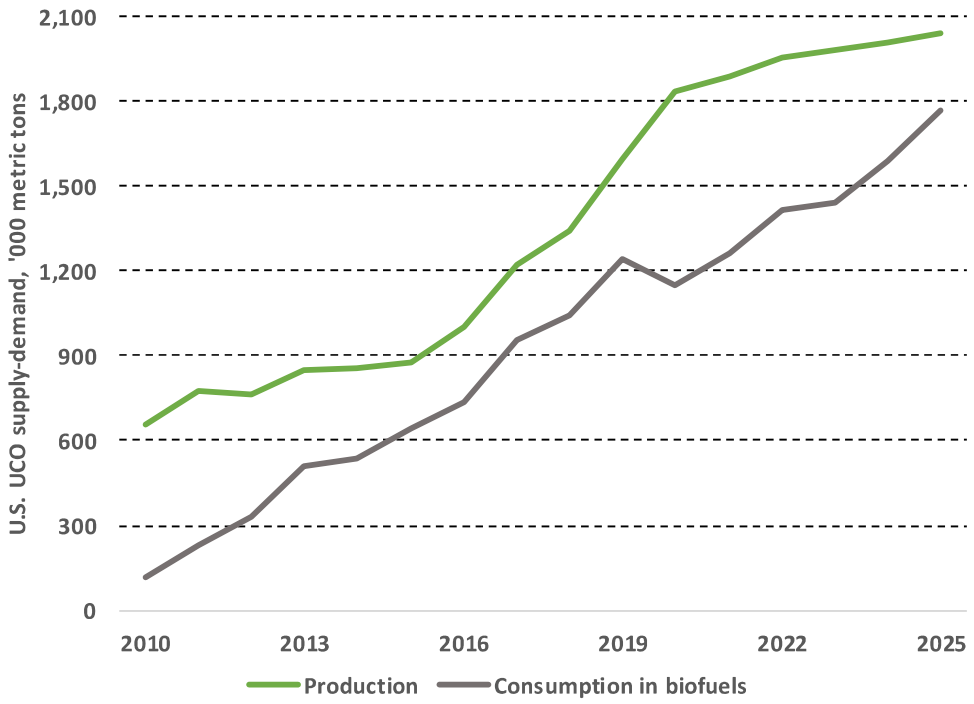
The availability of used cooking oil (UCO)

UCO production grew rapidly until 2020 (see Diagram 11). The scope for further large boosts to collection rates appears to be limited. However, as the diagram reveals, output has been outstripping consumption in biofuels, with the excess exported or used in animal feed.

Therefore, the projected growth in UCO consumption for biofuel that is illustrated in the diagram may be accommodated by reducing the volumes that are currently exported or destined for feed mixing.

This provides reassurance that increasing BBD demand for UCO, most notably as a low Carbon Intensity (CI) feedstock in the Californian Low Carbon Fuel Standard, can be satisfied from the use of locally collected supplies.

Diagram 11: Past and projected growth in U.S. UCO output and use in biofuels



The increase that is projected to occur in UCO consumption in BBD is from 2.78 billion lbs. (1.26 million metric tons) in 2021 to 3.90 billion lbs. (1.77 million metric tons) in 2025, boosting the total use of UCO in BBD by 1.12 billion lbs. (0.51 million metric tons) over this four-year period.

If we convert this into BBD at 7.5-8.0 lbs. per gallon, this would provide the feedstock for between 140 and 150 million additional gallons of BBD in 2021-2025.

Minor oilseed crops

Crops that can be planted in rotation with other crops offer significant potential. They are attractive from an agronomic perspective in that they do not take land from other crops and can be planted in fallow periods and help to regenerate the soil.

There are several minor oilseed crops in the early stages of commercial development. The top three candidates are camelina, carinata, and CoverCress™.

1. Camelina is so far the only one of these three minor crops with EPA approval. Global Clean Energy (GCE) has announced plans to build a renewable diesel plant whose feedstocks include camelina grown on contracted acres. The company has signed a five-year offtake agreement for its renewable diesel with ExxonMobil.

   GCE states that 110,000 acres of camelina were to be planted in 2021 and 250,000 acres in 2022. To extend the projections to 2025, we assume that after 2022 the potential annual area growth is 50,000 acres, taking the total to 400,000 acres, with a yield of 1,500 lbs. of seeds per acre at an oil content of 32.5%.

   This implies that the oil output from GCE's camelina would rise from 84 million lbs. (38,000 metric tons) in 2021 to 304 million lbs. (138,000 metric tons) in 2025.

   If we convert this into BBD at 7.5-8.0 lbs. per gallon, this would produce between 10 and 11 million gallons of BBD in 2021 and between 38 and 41 million in 2025.

2. Carinata is a cousin of canola being developed for cultivation in the Northern Plains and Southeastern states by NuSeed. After reviewing the data, the EPA says it believes it will meet the 50% GHG reduction and advanced biofuel definition. Initially, it is being grown mainly in Argentina for the EU BBD market. By analogy with the experience in Argentina, it is plausible to project that in the U.S., it will be planted on a commercial scale on 50,000 acres in 2024 and 100,000 acres in 2025.

   With a seed yield of 2,000 lbs. per acre and 40% oil content, the U.S. production potential of carinata oil would be 80 million lbs. (36,000 metric tons) in 2025.

   If we convert this into BBD at 7.5-8.0 lbs. per gallon, this would produce between 10 and 11 million gallons of BBD in 2025.

3. CoverCress™ has been developed by CoverCress Inc., with seed selection based on pennycress, a winter weed with a high oil content growing throughout the U.S. It is a minor oilseed crop for which the company is contracting 20,000 acres in 2022, forecast to rise to 100,000 acres in 2023. Company sources expect potential growth to 350,000 acres or more by 2025. As with carinata, after reviewing the data, the EPA says it believes pennycress will meet the 50% GHG reduction and advanced biofuel definition required for approval.

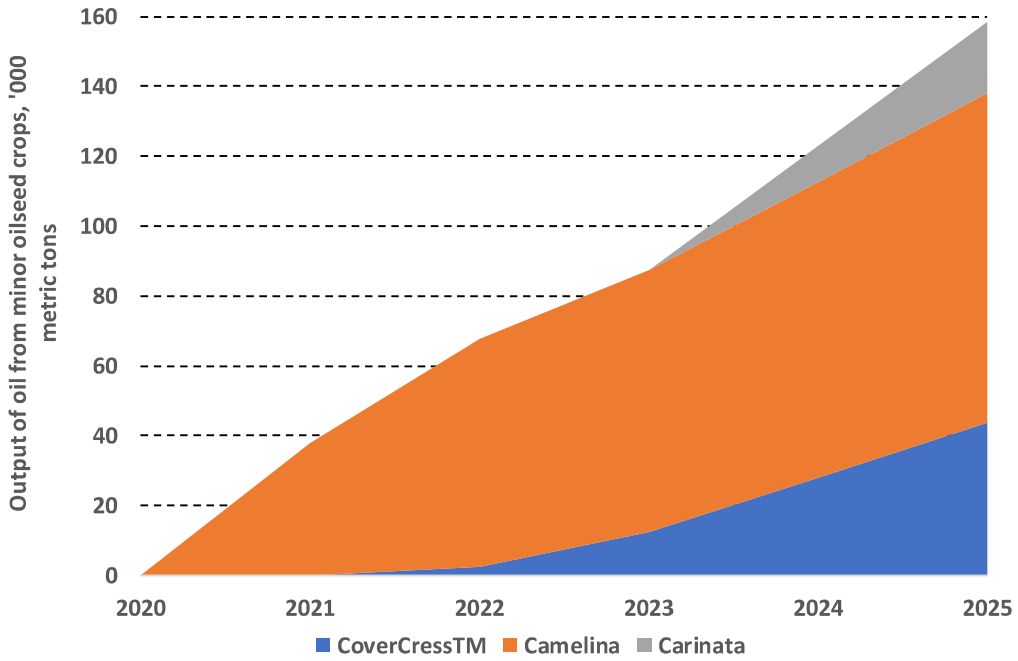
   CoverCress™'s seed yield is 1,500 lbs. per acre. At 32.5% oil content. U.S. potential output of CoverCress™ oil would be 171 million lbs. (78,000 metric tons) in 2025.

   If we convert this into BBD at 7.5-8.0 lbs. per gallon, this would produce between 21 and 23 million gallons of BBD in 2025.

Given the challenges of commercial development, however, we do not think that all three will achieve their full potential in this comparatively short time period.

Our overall forecasts of the oil supply in the U.S. from the three minor oilseed crops above are presented in Diagram 12. The outlook beyond 2025 is much stronger, but the capacities need to be built up.

Diagram 12: Projected growth in U.S. minor oilseed crop oil supply



The prospects for biofuel feedstock supply from these minor oilseed crops in the next four years may be summarized as:

At present, only one of the three minor oilseed crops (camelina) has secured EPA approval as a feedstock for advanced biofuel. The other two are still awaiting such approval.

Assuming the granting of this approval, a plausible, if conservative, projection would put total additional availability of vegetable oil from these three minor oilseed crops at 471 million lbs. (214,000 metric tons), as a result of an increase from a combined 84 million lbs. (38,000 metric tons) for camelina alone in 2021 to 555 million lbs. (252,000 metric tons) for all three crops in 2025.

Converting this growth into gallons of BBD at 7.5-8.0 lbs. per gallon, this would provide the feedstock for between 59 and 63 million additional gallons of BBD in 2021-2025.

Summary of the growth in biomass-based diesel feedstock supplies

The projections of the availability of BBD feedstocks described earlier in this report are brought together in Table 1. The largest contributors to the increases in feedstocks between 2021 and 2025 are the crushing industries, one crushing U.S. soybeans and the other crushing Canadian canola. Diagram 13 plots the potential increase in BBD supply.

Currently half of U.S. soybeans are exported as beans. Forecasts in the table are based on expansion plans announced to local crushing plants, which will respond to the growth in domestic soybean production and in the demand for BBD feedstocks.

The increase in Mexican crushing arises because the country faces a sizable meal deficit, while it is reported that there is significant underutilized crushing capacity. The projections indicate how much oil, obtained from U.S. beans, can be shipped to the U.S. for BBD output while reducing the need for Mexico to import soybean meal.

The increase in canola oil output reflects the growth in the Canadian crushing of canola that is exported at present. As with U.S. soybeans, canola crushers are implementing major investments in capacity and the projections in Table 1 reflects this expansion in capacity.

Increases in distillers' corn oil supply are tied to gradually increasing oil extraction rates from corn dry mills, while animal fat availability is linked to the growth in meat demand.

Used cooking oil use as a feedstock is underpinned by reductions in the volumes exported.

The minor oilseed crops are still in their infancy, but are being supported by innovative seed companies, launching improved varieties.

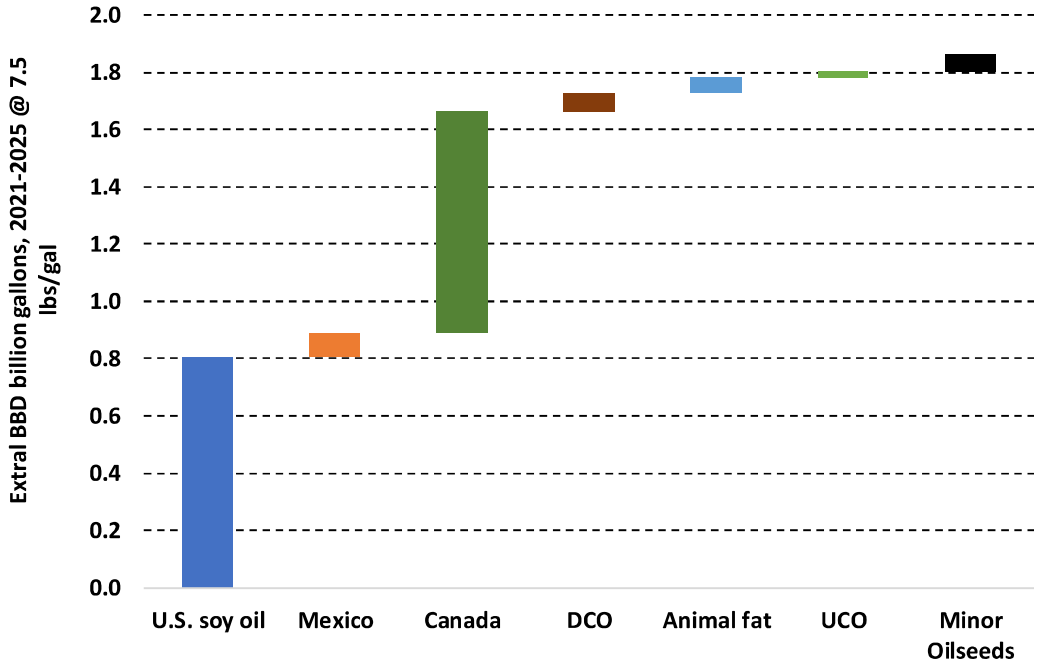
Table 1: The potential growth in North American BBD feedstock supply, 2021-2025

	N. American feedstock supply		Supply growth	BBD growth 2021-2025	
	Million lbs.	Million lbs.	Million lbs.	Million gallons	
	2021	2025	2021-2025	at 8.0 lbs./gal	at 7.5 lbs./gal
Domestic soybean oil	24,775	30,837	6,061	758	808
Mexican sales to U.S.	0	615	615	77	82
Canadian canola oil	0	5,772	5,772	721	770
Distillers' corn oil	3,980	4,474	494	62	66
Animal fats	10,327	10,750	424	53	56
Used cooking oil	1,889	2,044	156	19	21
Minor oilseed crops	84	555	471	59	63
Total	**41,054**	**55,047**	**13,992**	**1,749**	**1,866**

Note: It is assumed that between 7.5 and 8.0 lbs. of oils and fats are used to make one gallon of BBD. This reflects the differing feedstock requirement for BD and RD.

- **Combining the additional supplies of lipid feedstocks of North American origin outlined above raises the supply of suitable BBD feedstocks from 41.1 to 55.0 billion lbs., a total increase of 14.0 billion lbs. in the period 2021-2025.**
- **Converting this growth into gallons of BBD at 7.5-8.0 lbs. per gallon, this would provide the feedstock for between 1.749 and 1.866 billion additional gallons of BBD in 2021-2025, with the contribution of different feedstocks described in Table 1.**

Diagram 13: Extra potential supplies of BBD by feedstock, 2021-2025, at 7.5 lbs./gallon



VIA EMAIL

May 1, 2023

Massachusetts Department of Environmental Protection
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: **Massachusetts Clean Heat Standard Stakeholder Input**

Dear Commissioner Heiple,

We appreciate the opportunity to provide expertise to inform the development of a proposed Clean Heat Standard ("CHS") regulation and related heating fuel supplier reporting requirements. The undersigned thirty-seven organizations and fourteen individuals represent stakeholders with a strong interest in equitably cutting building sector emissions to ensure that we meet our greenhouse gas reduction requirements. **Our top priorities for a CHS for Massachusetts are ensuring adequate equity protections and an electrification-only compliance program, particularly for gas utilities.**

The Clean Energy and Climate Plan for 2025 and 2030 ("2025 and 2030 CECP") and the final report from the Massachusetts Commission on Clean Heat both recommended the immediate pursuit of a CHS. The report highlights that a CHS "can be a powerful tool for creating a new market for clean heating solutions by incentivizing obligated parties to deliver cleaner heating technology, electrify our building stock, increase building efficiency, and move away from fossil fuels."[1] A CHS for Massachusetts can only be useful for meeting our decarbonization and environmental justice mandates if such a program is properly implemented. It is critical that the Commonwealth gets the difficult details of this complex program correct, such as ensuring that equity informs every aspect of the proposal and prioritizing electrification over industry greenwashing like alternative combustion fuels.

The below represents our thoughts and recommendations on the stakeholder topics and questions provided in the MassDEP Stakeholder Discussion Document, dated March 2023. Thank you again for the opportunity to comment and we look forward to working with you as this process unfolds.

[1] https://www.mass.gov/doc/massachusetts-commission-on-clean-heat-final-report-november-30-2022/download, at vi.

I. FURTHER STAKEHOLDER PROCESS RECOMMENDATIONS

DEP should design the balance of its stakeholder process with different tracks for different types of stakeholder. First, we recommend that DEP work with DEP and EEA's in-house environmental justice and community engagement experts to design stakeholder input opportunities for people who would be impacted by the program who are not themselves or do not employ professional advocates.

Second, we recommend that DEP hold a series of technical sessions on key design questions for technical stakeholders including the undersigned clean energy experts and advocates. We recommend at least the following topics for exploration in technical sessions:

- Measure verification
- Compliance flexibility/banking
- Reporting
- Calculation of credits by technology
- Hybrid heat system credits
- Alternative Compliance Payment level
- Mass Save coordination

II. OVERARCHING COMMENTS

Before responding directly to the specific questions posed in the Stakeholder Discussion Document, we offer overarching comments on 1) program equity and energy justice considerations and 2) cost-effective long term emissions reduction strategies.

A. Center Equity and Advance Energy Justice

1. Program design should focus direct and indirect benefits on customers with the highest energy bill burden.

DEP should focus efforts in this program design and stakeholder consultation phase on soliciting input from environmental and energy justice advocates and communities, including the co-conveners of the Environmental Justice Table (Greenroots, Inc., Neighbor to Neighbor MA, Alternatives for Community & Environment (ACE), Coalition for Social Justice, Groundwork Lawrence, and the North American Indian Center of Boston), low income advocates, and housing justice advocates to inform program design for equity and energy justice.

In the interim, the undersigned offer the following preliminary comments based on our past work in collaboration with energy justice movement leaders. We posit that DEP should begin to

consider the burdens and benefits of CHS program design through the dual lenses of direct/immediate impacts and indirect/longer term or associated impacts.

Direct Burdens of a CHS

A market-based energy program without adjustment for income levels will lead to an inequitable distribution of burdens and benefits. Direct or immediate customer burdens under a CHS are likely to be experienced as increased costs for heating fuels, passed through to the customer from the obligated party that supplies their heating fuel. While higher income households can absorb increases in energy costs, energy bills take up a much higher share of a low or moderate income (up to at least 120% Area Median Income (AMI)) household's budget. Energy bill increases can force a choice for low and moderate income customers between paying those bills and buying sufficient food that month. In high cost of living areas like most of the Commonwealth, there are many customers who do not qualify for low income energy bill relief but who still struggle to pay to heat their homes (generally, those between 61-120% AMI). It is also important to note that low and moderate income energy customers represent a disproportionate share of Black and Brown residents of the Commonwealth.

Indirect Burdens of a CHS

Black and Brown communities are disproportionately burdened by the negative impacts on health and quality of life resulting from our current heating fuel economy, including production, refinement, transportation, storage, and end uses of combustion fossil fuels and bioenergy. On the one hand, a CHS can help alleviate some of these burdens if it significantly reduces combustion. On the other hand, increased incentives for bioenergy combustion fuels are likely to lead to continued or elevated negative impacts on host communities for those fuels' supply chains.

Another potential indirect burden of a CHS is housing displacement. Without protections for renters, landlords can use incentives subsidized by ratepayer or tax dollars like a CHS or Mass Save for building upgrades as a pretext for rent increases that force out low and moderate income renters from relatively affordable housing units.

A CHS that accelerates unit-by-unit electrification of housing, while necessary in the near term, will contribute to the indirect burden of an unmanaged gas system transition. Gas customers who are least able, either financially or legally, to electrify their own homes will have to pay higher and higher shares of the fixed cost of the gas system absent significant modifications to rate design. See Section II.A.2 below for further discussion of this issue.

Direct Benefits of a CHS

The most direct benefits of a CHS designed to address equity issues would be energy bill adjustments to eliminate the bill impact of the CHS on low and moderate income customers. Directing the revenues from a Just Transition Fee like the one mentioned in DEP's Stakeholder Discussion Document to provide further energy burden relief for low and moderate income customers would be an additional direct benefit that could begin to ameliorate the energy burden concern.

Indirect or Delayed Benefits of a CHS

Clean heat technology and building envelope changes in a customer's home that are incentivized through Clean Heat Credits are either indirect benefits to customers (electrifying homes generally help with progress toward avoiding the worst impacts of climate change), or direct but delayed benefits (if done on that customer's home) including reduced energy bills, improved thermal comfort, increased property value, and improved indoor air quality. Equity and energy justice deficits in the delivery of comparable measures have dogged programs like Mass Save for decades.

We appreciate that DEP has begun to consider equity topics generally at this stage of CHS program design. We urge DEP to continue to develop its understanding of the direct and indirect burdens and benefits of a potential CHS, and focus both direct and indirect benefits on customers with the highest energy burden.

2. DEP should coordinate closely with DOER and DPU on key complementary strategies for equity.

Implementing equity protections and energy justice initiatives under a CHS will require close coordination with agencies including the Department of Energy Resources (DOER) and the Department of Public Utilities (DPU).

Rate Design

For moderate income customers to be able to meaningfully access the indirect benefits of a CHS, we will need an electric rate for customers using efficient electric heating. Potential direct benefits of the CHS for low and moderate income customers whose residences have not been electrified may also be delivered most effectively via electric (or gas) rates or bill adders. To be in position to execute these program elements, the DEP should establish a cross-agency working group, or utilize the 2022 inter-agency Clean Heat task force staff connections.

Alternative Portfolio Standard

The Alternative Portfolio Standard ("APS") incentivizes some clean heat technologies via a surcharge on electric rates. The 2025 and 2030 CECP stated that DOER would be conducting a rulemaking to align the APS with CECP priorities. While we urge DEP to work with the legislature to eliminate the APS, as detailed more fully in response to the Interactions with Other Programs Topic below, DEP should work with DOER to ensure that efforts are not wasted on a futile program redesign.

Managed Transition Off of Gas

As mentioned in the indirect burden discussion in Section II.A.1 above, perpetuation in the medium to long term of the unmanaged transition off of gas that is already underway will be an inequitable disaster for low and moderate income gas customers. Gas rates are increasing due to increases in fixed costs of the system, even before implementing programs like the CHS.[2] As gas rate increases accelerate and those fixed costs are spread across fewer and fewer customers with increasing electrification, customers who can afford to electrify will do so and customers who can't afford to electrify, or whose landlords won't electrify, will be stuck with skyrocketing rates.[3] An equitable and least-cost transition off of gas will require creating and executing a plan for strategic decommissioning of street segments and neighborhoods and transition to thermal heating networks and individual home heat pumps based on local electric capacity data and maximizing for avoided costs. This transition will require a restructuring of the gas utility sector on the order of the Commonwealth's electric system restructuring.

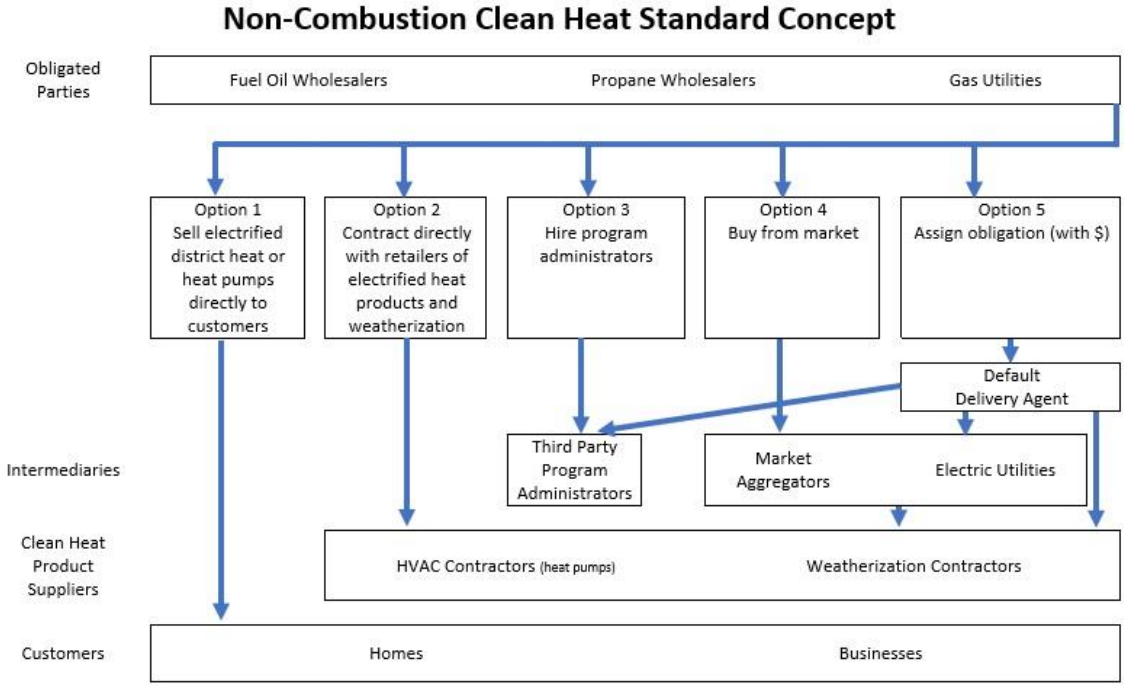
Despite nearly three years elapsing since now-Governor Healey filed her Future of Gas petition with the DPU, the Commonwealth has barely begun to reckon with this challenge. The Gas System Enhancement Plan Working Group required by the 2022 Act Driving Clean Energy and Offshore Wind[4] and the anticipated interim Order in DPU 20-80 may begin to make progress on gas utility restructuring, but in any event DEP should be working with DOER and DPU to force accelerated progress on equitable gas restructuring.

[2] See Conservation Law Foundation, Getting off Gas: Transforming Home Heating in Massachusetts at 7-9 (Dec. 2020), https://www.clf.org/wp-content/uploads/2020/12/CLF_GasWhitepaper_GettingOffGas.pdf.
[3] See Building Decarbonization Coalition, The Future of Gas in New York State, pages 43-45 https://buildingdecarb.org/wp-content/uploads/BDC-The-Future-of-Gas-in-NYS.pdf.
[4] Ch. 179 of the Acts of 2022, § 68.

B. Prioritize the Most Cost-Effective Long Term Emissions Reduction Pathway

1. DEP should focus compliance pathways on non-combustion technologies rather than biofuel blending, particularly for gas.

The CHS must be designed with an eye toward 2050 emissions limit compliance as well as 2030. Full efficient electrification of homes, whether by individual heat pumps or networked geothermal solutions paired with weatherization, should be the emissions reduction priority of the program. Allowing bioenergy blending strategies to qualify for Clean Heat Credits, particularly in the case of fuels in the gas distribution system, is not consistent with 2050 mandates. Rewarding alternative fuel blending in the gas system with Clean Heat Credits incentivizes the continued use of combustion-only and hybrid heating systems. It also incentivizes near-term, marginal reductions in emissions that don't support the overarching, long-term, most cost-effective pathway towards net zero. As the 2025 CECP and the 2030 CECP noted, "While partial electrification through the use of such hybrid systems can provide significant GHG reductions by 2030, a hybrid strategy alone makes achieving net zero in 2050 more difficult and expensive for all customers."[5] The graphic below demonstrates how any obligated party under the CHS who is not allowed to simply drop in alternative combustion fuels to earn Clean Heat Credits would still have a range of options for program compliance.



Adapted from original RAP White Paper for Clean Heat Standard in VT, Figure 10, page 32 https://www.eanvt.org/chs-whitepaper/

[5] 2025 and 2030 CECP at 58.

2. *DEP should define "Heat" broadly across electrification technologies.*

Rather than only allowing credits for electrifying space heating appliances, DEP should define the universe of electrification technologies that can qualify for Clean Heat Credits to include any piece of equipment that currently combusts fossil fuels delivered by the obligated entities, with the caveat that any qualified heating equipment must be highly efficient and engineered for cold climates. In addition to furnaces and boilers, this would include water heaters, stoves, and clothes dryers. The Clean Heat Credit value for the equipment would be based on its projected avoidance of carbon emissions over its lifetime.

3. *DEP should use the High Electrification Scenario, not the Phased Scenario.*

Use of the 2025 and the 2030 Clean Energy and Climate Plan "Phased" Scenario to design the CHS is not justified and will likely lead to under-achievement of necessary emissions reductions for the buildings sector. Acadia Center raised alarm about calibrating CECP implementation to the Phased Scenario immediately after the CECP was published in July 2022, particularly as it relates to the balance of near-term emphasis on whole-building versus hybrid electrification approaches.[6] In an analysis prepared for Conservation Law Foundation, Synapse found that the likely CHS compliance portfolio under the Phased Scenario would leave a substantial gap between achieved and required sector emissions for 2030.[7]

The question of how many whole-building heat pump installations the CHS is targeting is critical – particularly in the next seven years as we move towards 2030. The 2025 and the 2030 CECP emphasized the Phased Scenario as the preferred pathway, but as Acadia Center pointed out in a detailed fact sheet responding to the 2025 and 2030 CECP the CECP does not clearly articulate why this scenario was preferred over the "High Electrification" Scenario.[8] Moreover, the two scenarios have very different visions for the target level of electrification by 2030. The key differences between these two scenarios are important to understand, because although the CECP promotes the "Phased" scenario as the best path forward throughout the report, their own analysis shows that the net costs of the Phased and High Electrification scenarios are nearly identical, with the "Flexible Load Sensitivity" version of the High Electrification Scenario actually being the lowest cost of any scenario analyzed, and about $0.2 billion cheaper than the Phased Scenario (Figure A.17 on page 24 of CECP Appendix A: Technical Pathways Modeling).

---

[6] Acadia Center, So Close, But Yet So Far: MA 2025/2030 Clean Energy and Climate Plan, https://acadiacenter.wpenginepowered.com/wp-content/uploads/2022/07/AcadiaCenter-CECP-Fact-Sheet.pdf.
[7] Synapse Energy Economics, "Massachusetts Clean Heat Standard: Policy and Regulatory Analysis" at slides 7-8, https://www.clf.org/wp-content/uploads/2023/03/Massachusetts-Clean-Heat-Standard-%E2%80%93-Policy-and-Regulatory-Analysis.pdf.
[8] See Note 6, at 3-5.

This is despite a number of charitable assumptions in the modeling that favor the Phased scenario – 1) Dramatically underestimating the level of methane leaks from the gas system; 2) Using an outdated (AR 4) global warming potential (GWP) for methane and failing to consider methane emissions on a 20-year timescale; 3) Not accounting for out-of-state GHG emissions from the production and transmission of both fossil fuels and biofuels; and 4) Making the blanket assumption that all biofuels (including 'renewable natural gas' and biodiesel) are GHG-neutral. Combined, these four assumptions are enough to significantly skew the analysis in favor of the Phased Scenario.

The Phased Scenario calls for about 6% of Massachusetts homes to rely solely on heat pumps for space heating by 2030 and 21% of homes to rely on a hybrid heating system by 2030 (Table E.3 Appendix E). This is in stark contrast to the High Electrification Scenario, which calls for about 18% of homes in the Commonwealth to rely solely on heat pumps for space heating by 2030, with an additional 10% of homes relying on hybrid heating systems (Figure A.6 Appendix A). **In other words, the Phased Scenario envisions about *one third* as many homes heated solely by heat pumps in 2030 and *twice* as many homes relying on hybrid heating systems in 2030.**

The Phased Scenario is also much less bullish on near-term full electrification of commercial buildings when compared to the High Electrification Scenario. The Phased Scenario calls for about 11% of commercial buildings to rely solely on heat pumps for space heating by 2030, with about 8% of commercial buildings relying on hybrid heating. The High Electrification Scenario calls for about 20% of commercial buildings to be heated solely by heat pumps in 2030, with about 3% of commercial buildings relying on hybrid heating. (Figure A.7 Appendix A). **In other words, the Phased Scenario envisions about *half* as many commercial buildings heated solely by heat pumps in 2030 and over *twice* as many commercial buildings relying on hybrid heating systems in 2030.**

Further, the 2025 and the 2030 CECP largely abstains from taking a position on whether decommissioning of the gas distribution system will be necessary to achieve climate goals and at what scale decommissioning will need to occur. The CECP instead makes inconclusive statements like, "Although Docket 20-80 has not yet been finalized, targeted decommissioning of the gas distribution system may be necessary to support a just and equitable transition toward electrified heating." There are, for example, no metrics in the 2025 and the 2030 CECP regarding miles of gas distribution pipes decommissioned. The Phased Scenario envisions the number of homes relying on some level of natural gas heating actually *increasing* 13% by 2030 compared to 2020 levels, while the High Electrification Scenario envisions the number of homes relying on some level of gas heating decreasing about 11% by 2030 compared to 2020 levels (Figure A.6 Appendix A). A clear vision for the future of the natural gas system is absolutely essential to accurately set whole-building electrification targets that inform the CHS.

III. SPECIFIC STAKEHOLDER QUESTION RESPONSES

Topic #1 – Setting the Standard

- **Does this general approach [described in Topic 1] to setting the stringency of the standard makes sense? If so, how could it be refined? If not, what alternative would be preferable?**
    - It is essential that the Commonwealth reduce emissions in the building sector to 15 MMT by 2030 as required in the CECP for 2025/2030. This figure includes emissions from residential, commercial, and industrial heating applications. We bring to your attention page 4 of the Discussion Document, paragraphs 1 and 2, which are inconsistent on whether industrial emissions are to be included in a CHS. Our position is that emissions from all three sectors must be included.
    - Assuming that industrial emissions are factored in, then we agree that building emissions should fall by 5.1 MMT over 5 years, or very close to 1 MMT per year. However, we recommend taking a different approach than requiring emissions to fall by a flat 7% per year. The problem with that approach is that the absolute emission reductions in the first year would be much higher than in the fifth (and subsequent years going out to 2050), much higher than 1 MMT in the first year, decreasing each year until the absolute emissions would be less than 1 MMT per year.
    - We favor an approach that would smooth out the absolute reduction in MMT to 1 per year by varying the percentage requirement as necessary. If industrial emissions are included and the starting point is 20.1 MMT in 2025, then a steady 1 MMT per year reduction could be achieved with a 5% standard in 2025, increasing to 7% by 2030.
    - An important reason to smooth out the absolute reduction is that the market for electrification will take time to mature. The supply chain and consumer demand will both be much stronger in 2030 than they will be in 2025.

Massachusetts Building Sector Emissions Reduction Pathway Assuming Constant

Year	Emissions Target (MMT CO_2e)	Annual Emissions Percent Decrease	Annual Emissions Absolute Change (MMT CO_2e)
2025	17.2	6%	N/A
2026	16.2	6%	1
2027	15.2	6%	1
2028	14.3	6%	0.9
2029	13.3	7%	1
2030	12.2	7%	1.1
Cumulative 6-Year Emissions Reduction	5.0		

- DEP also needs to develop a plan for optimal use of hybrid heat pump systems. Gas utilities currently lobby for a switchover point as high as 30-35° F, while the appropriate point based on modern heat pump efficiency should be no higher than 10° F. Gas heating systems that are retained as part of hybrid set-ups, controlled by the installer to be the primary source of space heating during the winter heating season,[9] cannot be misleadingly labeled "back-up" systems. These partial set-ups will not meaningfully contribute to a reduction of greenhouse gas emissions. DEP should hold technical sessions to work out how different hybrid systems function, what role consumers will play, and what type of controls will be in homes, among other topics.

- **Should the standard be expressed in terms of GHG emissions reductions, clean heating energy supplied, or something else such as square feet of conditioned space converted to clean heat?**
  - We agree that the standard should be set in terms of GHG reductions, but year-by-year GHG reductions through 2030 cannot be the only guiding principle for establishing the overarching structure of the CHS. In addition to program design elements that solve for equity, the CHS must be designed in a way that fully complements the most cost-effective path to economy-wide net zero emissions in 2050, including the most-cost effective path for strategic decommissioning of the natural gas system as the Commonwealth moves towards net zero.
  - With regard to understanding the GHG emissions reduction from an electrification measure, DEP should look to Mass Save's methodology for evaluating energy savings and benefits.

- **Is the carve out approach the best way to ensure progress on electrification, or are there other options that should be considered?**
  - Electrification and weatherization should be the only compliance options allowed, particularly for gas utilities. See Section II.B.1 above. Given the markedly different regulatory postures of gas utilities and delivered fuel companies, we recommend that DEP consider the two categories of obligated entities separately. For gas utilities, whether investor- or municipally-owned, the suite of compliance measures must consist entirely of electrification and weatherization and not include alternative combustion fuels, whether bioenergy or hydrogen-based.
    - Biofuels, and RNG in particular face several key fundamental challenges when considering any possible role in decarbonization of building heating: **1)** Limited availability of truly sustainable (e.g. non-energy crop) biomass feedstocks, particularly in New England. **2)** Opportunity cost associated with using a high-value resources (limited biomass feedstocks) in a relatively low-value decarbonization end use (building heat, a sector that is relatively easy to electrify) **3)** Wide

[9] See D.P.U. Docket 22-149, Responses to the Attorney General's Second Set of Information Requests, Information Request AG-2-4, at 2, available at https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/17101289.

variations in lifecycle emissions associated with biofuels based on production pathway **4)** High fuel cost that will increase as demand for biofuels across multiple sectors continues to increase **5)** Inability to solve core methane leak problem associated with the gas distribution system **6)** Lack of viable, long-term role in full decarbonization of the gas distribution system is incompatible with net zero targets.

- Hydrogen also faces several key fundamental challenges when considering its role in decarbonization of building heating **1)** Opportunity cost associated with using clean electricity to produce hydrogen for a sector of the economy (building heat) that is relatively easy to electrify. This opportunity cost applies both to renewable electricity generation land use and required capital investments. **2)** Overall inefficiency of the hydrogen production, transmission and combustion process relative to building electrification via heat pumps **3)** High fuel cost that will increase as demand for hydrogen across multiple sectors continues to increase **4)** Pipeline compatibility issues with hydrogen blends exceeding 7% of energy flowing through the gas distribution system **5)** Safety issues associated with combustion of hydrogen, particularly in residential settings **6)** Lack of low cost geological hydrogen storage in the northeast. **7)** Lack of a viable, long-term role in full decarbonization of the gas distribution system is incompatible with net zero targets.
- To the extent that any waste-derived gas bioenergy is available in the Commonwealth, the energy required to refine it to pipeline quality methane and methane leaks from the process and subsequent pipeline delivery mean that the waste gas bioenergy would be better flared or utilized on-site in electricity generation, high efficiency combined heat and power, or co-located industrial processes.[10] And hydrogen produced via renewable energy is simply an extremely low efficiency energy storage mechanism in the context of an end use that could otherwise be electrified. Alternative gasses are not a long term solution for the buildings sector, so incentives should not encourage buildout of these wasteful processes in the near term.[11]

- With regard to delivered fuels, we reserve the right to comment on whether delivered fuel companies should be allowed to earn Clean Heat Credits for biofuels delivered to existing customers until more information is gathered

[10] See D.P.U. 22-32, Conservation Law Foundation, Direct Testimony of Michael J. Walsh and Jonathan Krones at 6-9 (July 15, 2022), https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/15198064, and Acadia Center, D.P.U. 20-80 Alternative Regulatory Proposal Comments at 8-12 (May 6, 2022), https://acadiacenter.wpenginepowered.com/wp-content/uploads/2022/05/Acadia-Center-DPU-20-80-Regulatory-Proposal.pdf.

[11] See Bakkaloglu, et al., *Methane emissions along biomethane and biogas supply chains are underestimated*, ONE EARTH 5, 724–736 (2022) https://www.sciencedirect.com/science/article/pii/S2590332222002676 and D.P.U. 22-149, Statement of Robert W. Howarth, Ph.D (Jan. 4, 2023), https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/16840893. Conservation Law Foundation will be releasing a comprehensive bioenergy report in the coming months with modeling and analysis on this issue.

about the supply of the biofuel stocks, including incremental costs, available volume, GHG accounting, and provenance.

- **How should the standard accommodate clean heat that is deployed before the program takes effect; should these systems count toward required "reductions"?**
    - Qualifying clean heat that is deployed before a CHS takes effect must be incorporated into the baseline for emissions reductions, and the standard should be annually reset according to the best available knowledge of the emissions inventory in the building sector. The Commonwealth is too far behind on necessary building sector emissions reductions to allow obligated entities to further delay compliance actions by pulling in past activity.

- **Is a carve-out a good approach to ensuring equity, and if so how could the specific requirement be determined?**
    - Carve-outs could help achieve equity goals but are insufficient alone to address equity issues created by the program. While carve-outs might be a valuable tool to direct weatherization and electrification toward customers who are not being adequately served by existing programs or who would not be served by a strict least-cost market approach to a Clean Heat Standard, DEP must do more to ensure that customers with the highest energy burden are not harmed by the program. See Section II.A above and responses to Topic 4 below for additional content on this topic.

- **Should the CHS be supported by a separate declining cap on emissions to ensure emissions outcomes, such as a "cap-and-invest" program for the building sector?**
    - We request further clarification from DEP on their understanding of a cap and invest program relative to a CHS. If a CHS is going to drive emission reductions towards 2030 and beyond, then the amount of clean heat credits that an obligated entity must create or obtain each year should correspond to an annual cap on emissions. The CHS and the declining cap support each other. Whether there should be a separate cap and invest program is another question.

Topic #2 – Regulated Heating Energy Suppliers

- **Which companies should be subject to the standard?**
    - First, it is imperative that electric utilities NOT be included as obligated entities. A properly designed CHS needs to focus on driving efficient electrification and weatherization that is not already happening under existing programs, and needs to help shift the costs of this transition from electric bills to fossil fuel bills.
        - Replacement of less efficient heating under the purview of electric utilities (electric resistance) is already robustly cost effective under the Green Communities Act (i.e. Mass Save). While the Commonwealth needs to continue to make it easier for electric resistance customers who have not yet switched to access heat pumps, this can be done via the

compliance measures element of CHS program design. See Option 2 in the graphic included with Section II.B.1 above.

- Gas utilities, including municipal gas utilities, must all be obligated entities under a properly designed CHS. We are currently agnostic as to whether gas suppliers should also be obligated entities, as long as every gas therm delivered in the Commonwealth is accounted for in setting a gas utility and/or supplier's compliance obligation and alternative gas fuel blending is disallowed as a compliance pathway. It may be most administratively efficient to regulate only the delivery utilities, while including suppliers as obligated entities could create a more robust market for Clean Heat Credits generated by third party heat pump and weatherization vendors.
- Oil and propane providers should also be subject to the standard. According to the Energy Information Administration "Residential Consumption Survey released in March 2023, delivered fuels serve 27% or 690,000 homes in Massachusetts. Exempting suppliers of these fuels would almost certainly make it impossible to achieve the aforementioned 1 MMT of GHG reduction per year necessary. It would also be unfair to low- and moderate- income consumers of gas utilities who would be affected by the imposition of the standard on gas entities.

- **How can compliance be streamlined for small fuel suppliers?**
  - As stated above, we will withhold judgment on whether the obligation should be on wholesalers or retailers until further information is provided. This is an example of a topic that could be addressed in technical stakeholder sessions.

- **Should municipally-owned gas and electric utilities be treated differently under the standard? If so, how can this be accomplished in a manner that is fair to customers of fossil fuel suppliers that operate in multiple utility service territories?**
  - All electric utilities should be excluded from obligated party status, including municipal electric utilities. The Commonwealth's four municipal gas utilities should be regulated alongside the other gas utilities for the purposes of the CHS. It would be particularly unfair to impose another obligation on investor-owned utilities (that would be passed onto their customers) while exempting municipal gas utilities.

Topic #3 – Credit Generation

- **Which clean heat technologies should be eligible for crediting under the CHS? When and how should new options, such as hydrogen and advanced biofuels, be evaluated?**
  - The CHS should credit efficient electrification and weatherization only, particularly in the context of gas utilities and/or suppliers. We are opposed to crediting biomethane, hydrogen, or synthetic fuels blended into the gas distribution system. See discussion in Section II.B.1 and in response to Topic 1 above. DEP states in Topic 3 that "clearly… bioenergy that is manufactured from waste feedstocks and does not adversely affect local air quality" should

be credited. To the extent that this refers to biomethane, we strongly disagree. To the extent that this refers to liquid biofuels, we are withholding a definitive position regarding advanced biofuels as "drop-in" replacements for #2 heating oil and propane until a thorough analysis is conducted by DEP on the supply and emissions profile of these fuels. Specifically, it is important to understand the cost of biodiesel before and after federal incentives, the quantity of potential feedstocks, and the provenance of potential feedstocks. If DEP considers allowing liquid biofuel blending to qualify for Clean Heat Credits, it could consider requiring the obligated entity to prove that a certain percentage of their customers use oil as backup for a heat pump.

- **How should the amount of credits be calculated for the eligible technologies? What existing calculation methods could MassDEP consider, reference, or adopt?**
    - As a starting point, we recommend that DEP consult with DOER to reference the Technical Resource Manual used by Mass Save to determine the energy savings and GHG reduction attributable to heat pumps and weatherization. This question is truly key to the whole program design. To get it right, we recommend that DEP and DOER jointly conduct a focused set of technical sessions with stakeholders.
    - We propose the following grounding principles for consideration: 1) any methodology must take into account projected declines in electricity sector emission factors over the coming years; 2) lifecycle accounting must be used if any biofuels are deemed an eligible technology, and if DEP uses existing models for lifecycle accounting they must adjust for local conditions; and 3) DEP needs to closely examine how to credit hybrid heating systems, as two homes with identical "hybrid" set ups could be using 100% electric heat or 100% fossil heat in the winter.

- **Is it necessary to develop emission factors for electricity, or can electricity be counted as a zero- emissions energy supply for crediting purposes given the CES requirement to decarbonize the electricity supply? Are there other aspects of electrification emissions that should be incorporated in the standard, such [as] seasonal emissions factors or refrigerant emissions?**
    - In order to drive the levels of electrification called for in the 2025 and 2030 CECP and Commission on Clean Heat Final Report, and given that electric sector emissions are already counted in a different sector of the Commonwealth's emissions inventory, for the purposes of a properly designed CHS electricity should be counted as zero-emissions in the case of qualifying electric heat pumps and appliances replacing fossil fuel heating equipment and appliances. How to treat both 1) Heat pumps replacing resistance heating and 2) weatherization of partially/fully electrically heated buildings will require further coordination with MassSave that should be discussed in technical sessions.

- Given the more pressing local public health impacts from co-pollutants released in combustion appliances, DEP should still assume zero emissions from heat pumps in the initial design of the program despite the GWP of leaked refrigerants. DEP should continue pursuing refrigerant emissions reduction strategies in the supply chain and installer community, including incentivizing factory sealed heat pumps, refrigerants with lower GWP, contractor retraining, and higher payments for returning the refrigerant post decommissioning.

- **Should weatherization be credited in the absence of other clean heat? How can weatherization crediting be calculated for projects that include clean heat?**
  - DEP should use Mass Save's generally accepted energy efficiency accounting of avoided emissions for crediting weatherization in the absence of other equipment installations.

- **Should MassDEP require third party verification? If so, what specific requirements are appropriate?**
  - Verification will be critical to the credibility and emissions reduction efficacy of a CHS, and also one of the more challenging aspects of program design. DEP should first consider the data that can be obtained from gas and electric utilities. Historically, the Commonwealth's utilities have been more protective of their customers' data than they are of their customers' planet and future. DEP and partner agencies should not settle for the utilities' usual prevarication on this subject. Additional verification options may be surfaced via a technical session. The best approach for verifying the extent to which electric heating is being utilized in hybrid heating arrangements or "fully electrified" buildings in which the "emergency only" fossil fuel heating system is still operable will be a topic of critical importance that demands further attention in technical sessions.

- **How should MassDEP define and identify credits that support equitable outcomes?**
  - As we discuss in Section II.A.1 above, credits that support equitable outcomes are a potential indirect benefit of a CHS. In addition to consultation with stakeholders with lived experience of the equity pitfalls of programs like Mass Save, DEP could consider the following incomplete list of potential equity priorities for delivery of indirect benefits: Title I schools, community health centers, food pantries, homeless shelters, and warming centers. Per Section II.A.2 above, DEP should also consider enhanced incentives for networked geothermal projects that migrate entire street segments off of gas.

Topic #4 – Compliance Flexibility and Revenue

- **Should the standard include an ACP option? If so, how should the payment level be established?**
  - Yes, there must be an ACP option. It is unclear how the program would work cost effectively without one. The level should be sufficient to provide the incentive needed to electrify one home.

The ACP payment level will not necessarily match the current $10,000 incentive level established by Mass Save. We note that while DEP states in the Topic 4 discussion that "[T]he Mass Save program has already established $10,000 as an appropriate incentive for conversions to a fully electrified home", Mass Save's incentive levels have not demonstrated the ability to scale heat pump adoption, particularly among LMI households, at the speed and scale necessary to match the levels of adoption necessary to achieve the CECP emissions targets. The appropriate methodology for determining the proper ACP level to achieve the building electrification goals necessary to comply with CECP Buildings Sector GHG emissions targets is a topic of critical importance that should be further discussed in technical stakeholder sessions.

- **Are other revenue generation options, such as a building sector "cap-and-invest" program, necessary or desirable for addressing equity or other revenue needs?**
    - Other revenue generation programs or opportunities will definitely be necessary to fund equitable building sector electrification (however, these are generally outside the purview of DEP):
        - As mentioned above, electric utilities should continue to work towards reducing emissions associated with electric heating, both by targeting resistance electric heat to heat pump conversion opportunities and improving envelope efficiency of all-electric buildings.
        - A state appropriation in support of the Zero Carbon Renovation Fund.
        - Issuance of bonds to decarbonize public buildings.
    - Additional mandates will be necessary to drive private sector funding toward building sector electrification:
        - A statewide Building Performance Standard, starting with buildings greater than 20,000 sf.
        - All-electric building codes so that HVAC systems installed this decade will not have to be replaced in the 2040s.
    - Please refer to our response to the final question under Topic 1 regarding the relationship of a cap and invest program to a CHS.

- **What are the best ways to use revenue? For example, should all revenue be used to fund new clean heat or would it be appropriate to provide ongoing support to LMI customers that fully electrify their homes (e.g., direct bill assistance, free routine maintenance, etc.).**
    - CHS program revenues (primarily from Alternative Compliance Payments) are a variable funding stream that can be directed toward remedying the direct burdens of a CHS with a direct benefit to customers in the form of bill relief

for LMI customers through existing programs run by the Low Income Energy Assistance Network and community action agencies. It will also be necessary to direct portions of the revenue to installations of clean heat equipment to keep making progress toward the program's emission reduction goals. Prioritizing low and moderate income customers for at least 40% of those benefits (see Section II.A.1) is appropriate from an equity perspective.
    - In the longer term, DEP should work with DOER, DPU, and the Attorney General's Office to pursue electric rate reform strategies for equity and energy justice.

- **Are there other flexibility components that may be appropriate, such as multi-year compliance or credit banking?**
    - Generally yes, but we reserve the right to make further comment upon seeing a more detailed proposal. This is an important topic that should also be covered in a series of technical sessions. A certain amount of flexibility may be required to deliver resource-intensive distributed electrification. Less to no flexibility should be granted if DEP allows liquid bioenergy blending.

- **Are the flexibility options presented here sufficient to address weather variability, or will some other approach be needed, such as weather-normalization of reported data?**
    - It will be necessary to weather-normalize reported data in order to adjust each year's Clean Heat Credit quota. We recommend that the quota be set in the first few years assuming heating degree days below the average of the last five years in order to reduce the chances that emission reductions will come in lower than desired.

Topic #5 – Reporting Requirements for Heating Energy Suppliers

- **How should MassDEP structure the reporting requirements for delivered fuels to ensure that all emissions from heating homes and businesses in Massachusetts are reported while minimizing the administrative burden of reporting?**
    - As we noted in response to Topic 2, we would need to see more information before providing an opinion on this topic. We recommend that DEP hold technical sessions on this topic.

- **Should any exceptions or special requirements be included, such as for cooking fuel or for synthetic fuels such as "renewable diesel"?**
    - No. The emissions and equity impacts of special fuel types should be handled through other aspects of program design.

- **How often should reporting be required (monthly/quarterly/annually)?**
    - Reporting should be required quarterly from all obligated entities. The data that is currently required to be reported under Mass Save, including which customers were served along the parameters of measures delivered, residential vs. commercial, building type, residential vs income-eligible, by town or zip code,

should be considered the baseline. Reporting for hybrid heating situations will be complex and should be developed via technical sessions.

Interactions with Other Programs

- **Are there cases where "double dipping" to earn incentives from multiple programs should be prevented, or possibly encouraged such as to support LMI energy consumers?**
    - DEP should avoid "double dipping" from an emissions accounting perspective, but enhanced incentives should be used to help achieve equity priorities. The CHS should be well coordinated with Mass Save for several reasons, one of which is to ensure that LMI consumers are well-served.

- **How can the APS program best be accommodated in the CHS program design?**
    - The initial program design of the CHS should ignore the APS. The APS should be eliminated, as the clean energy incentivization purpose of the program will be subsumed within the CHS and the current design of the APS is not aligned with the Commonwealth's emissions goals. As the Commission on Clean Heat stated in their Final Report, "Given that the APS was designed to incentivize combined heat and power, which it is now phasing out, and it is weak incentive for heat pump technology, we further recommend that the state consider eliminating the APS program and using the new Clean Heat Standard as a more effective program to reduce GHG emissions and support electrification in the thermal sector."[12] Removing the APS would help reduce electric rate impacts as more and more customers heat their homes with electricity. Logistically, DEP should encourage the legislature to repeal the APS while in the near term designing the CHS to ignore the APS. There should be no alternative gas blending qualified as a compliance measure in a properly designed CHS, so this would primarily result in a temporary additional incentive for electrification until the APS ends.

- **Should the program be supported by a declining cap on emissions/cap and invest program for the heating sector?**
    - See responses to prior cap and invest questions in Topics 1 and 4.

Economic Analysis

- **Consumers will incur energy costs, including costs of the clean energy transition, regardless of whether MassDEP pursues a CHS. How can incremental impacts of a CHS be isolated from these costs?**
    - From now through 2050, it will be extremely difficult to sort out to what extent heating costs will change as a result of policies like the CHS, Building Performance Standards (BPS), appliance standards, building codes, technological advancements, changes in electricity costs (which impact the

[12] Final Report of the Clean Heat Commission, at 46.

cost of electrification), various market factors, and exogenous factors such as geopolitical situations (i.e. Russia vs. Ukraine). It is more important for DEP to monitor all aspects of the clean energy transition and to determine whether benefits and costs are being allocated fairly and efficiently.

- **What information sources could MassDEP consider or rely on if there is a need to project future prices of fuels, heat pump installations, etc.?**
    - It is impossible to project fuel prices on a long-term basis to a degree of certainty that would guide good policymaking. Further, most consumers make their decisions on heating equipment based upon their understanding of current equipment costs and their intuition about the long-term cost of fuel. They do not make purchase assumptions based upon a forecast from EIA or DOER. To achieve the requisite GHG reductions, Massachusetts must install about 100,000 heat pumps per year until every building is electrified. For that reason, it would be of great value to continually monitor developments in the markets for air-source and ground-source heat pumps (including networked geothermal). At present, there are no credible predictions of where heat pump costs will be in 5 or 10 years. The purpose of trying to project future heat pump costs is to help determine what, if anything, government can do to reduce the costs of installation, operations, and maintenance.

- **How could economic benefits be quantified, such as the macroeconomic benefit to Massachusetts of substituting spending on local heat pump contractors for spending on imported fossil fuels?**
    - One potential approach is to quantify economic benefits leveraging a similar approach as the Massachusetts 2050 Decarbonization Roadmap. The Roadmap utilized IMPLAN, a widely used input-output economic analysis software package, to evaluate expected economic impacts in the state for various net-zero complaint pathways. The Roadmap found that pathways that invested in local energy resources, including renewable electricity generation, electrification, and energy efficiency, created more jobs and demonstrated greater economic benefits by keeping money local than the pathways more reliant on imported energy. For example, the "All Options" pathway from the Roadmap (which emphasized deep electrification and broad renewable electricity buildout) had 17% higher economic "output" (the broadest measure of economic activity) in Massachusetts per dollar invested than the "Pipeline Gas" pathway (which relied heavily on imported alternative fuels).[13]

- **How can economic analysis be structured to inform equitable program design that benefits LMI energy consumers?**

[13] Massachusetts Decarbonization Roadmap, Economic and Health Impacts Report, Figure 7, page 14 https://www.mass.gov/doc/economics-and-health-impacts-report/download.

- The analysis should be holistic in nature taking into consideration upfront capital cost, operating cost, maintenance cost, air quality health benefits, job creation benefits, etc.

- **How can recent changes in federal incentives be incorporated into the analysis.**
  - The most relevant provisions of the Inflation Reduction Act with respect to clean heat are the following for residential consumers:
    - The HOMES rebate (Home Energy Performance-Based, Whole-House Rebate) offers generous support to homes that reduce energy usage by 25% or more. However, funding allocated to Massachusetts for this rebate is $73,233,910, which is tiny compared to what Mass Save spends in a year.
    - Similarly, the HEEHRA rebate(High Efficiency Electric Home Rebate) offers generous support to the electrification of low- and moderate-income households. However, funding allocated to Massachusetts for this is just $72,809,130. This is also tiny compared to what Mass Save spends in a year.
      - Note: Both rebates, HOMES and HEEHRA, will likely be spent before CHS goes into effect.
    - The federal tax credit (Section 25C) offers a 30% tax credit of up to $2000 per year for air-source heat pumps, heat pump waters, and electrical panel upgrades. Tax credits are also available for weatherization. Section 25D makes available at 30% tax credit, uncapped, for geothermal installations (both residential and commercial).
    - The Greenhouse Gas Reduction Fund (aka the Green Bank) is funded with $27 billion and an explicit mandate to promote equity and environmental justice. A Massachusetts version of the Green Bank can provide low-interest capital to projects capable of earning Clean Heat Credits.

    With all those resources, the Inflation Reduction Act will significantly help to defray the cost of electrification.

* * *

Thank you for the opportunity to comment. We look forward to working with DEP on additional stakeholder dialogue on this important topic.

Signed,

Comment Drafters

Caitlin Peale Sloan, **Conservation Law Foundation**

Larry Chretien, **Green Energy Consumers**

Ben Butterworth and Kyle Murray, **Acadia Center**

Cathy Kristofferson, **Pipe Line Awareness Network for the Northeast (PLAN)**

Audrey Schulman, **HEET**

Additional Signatories, Organizations

Sofia Owen, **Alternatives for Community & Environment (ACE)**
Jane Winn, **Berkshire Environmental Action Team**
Joel Wool , **Boston Housing Authority**
Anne Wright, **Building Electrification Accelerator**
John Carlson, **Ceres**
Paulina Casasola, **Clean Water Action**
Adele Franks, **Climate Action Now, Western Mass**
Laura E Gardner, **Climate Reality Massachusetts Southcoast**
David Melly, **Environmental League of Massachusetts**
Bob Armstrong, **FCCPR Climate Crisis Task Force**
Scott R Greenbaum, **Greene Energy Consultants, LLC**
Louise Amyot, **Greening Greenfield**
lzimmaro@lwvma.org, **League of Women Voters of Massachusetts**
Jeanne Krieger, **Lexington Climate Action Network (LexCAN)**
Emily Jones, **LISC Boston**
Kristina St. Cyr, **MA Association of Community Development Corporations**
Julie Curti, **MAPC**
Heidi Ricci, **Mass Audubon**
Logan Malik, **Massachusetts Climate Action Network**
Jeff Barz-Snell, **Metrowest Climate Solutions.org**
Anne Wright, **Mothers Out Front Massachusetts**
Rosemary Wessel**, No Fracked Gas in Mass**
Natalie Hildt Treat, **Northeast Clean Energy Council**

Erin Cosgrove, **Northeast Energy Efficiency Partnerships (NEEP)**
Kathryn Eiseman, **Partnership for Policy Integrity**
Tim Greiner, **Pure Strategies**
Deb Pasternak, **Sierra Club Massachusetts Chapter**
Mary Gard, **Sustainable Wellesley**
Steve Long, **The Nature Conservancy**
Claire Karl Miller, **UU Mass Action**
Lindsay Griffin, **Vote Solar**
Lisa Cunningham, **ZeroCarbonMA**

Additional Signatories, Individuals
State Representative Lindsay Sabadosa (member, Massachusetts House of Representatives)
State Representative Rodney Elliott (member, Massachusetts House of Representatives)
Jacqueline Royce (member, Boston Green Action)
Juliette Haas
Lisa Smith (member, Cape Ann Climate Coalition)
Louise Amyot (member, Greening Greenfield)
Martyn Roetter (member, Gas Transition Allies)
Mary Klug (member, 350MASS)
Michael McCord (member, Boston Green Action)
Patricia Nolan (member, Cambridge City Council)
Paul Popinchalk (member, 350 Central Mass)
Robert Triest (member, Department of Economics, Northeastern University)
Steven E. Miller (member, 350 Mass)
Susan Hoague (member, Cape Ann Climate Coalition)

May 1, 2023

Commissioner Bonnie Heiple
Massachusetts Department of Environmental Protection
100 Cambridge Street
Suite 900
Boston, MA 02114

Subject: Dandelion Energy Comments on a Clean Heat Standard

Thank you for the opportunity to comment on the discussion questions for a Clean Heat Standard (CHS) program design posed by the Massachusetts Department of Environmental Protection (MassDEP). The proposed Massachusetts CHS provides a critical opportunity to advance building decarbonization and reduce carbon emissions to achieve the requirements of the 2021 Climate Act.[1] Geothermal (ground source) heat pumps should play a critical role in helping to meet Massachusetts' building decarbonization targets, and the MassDEP should ensure that the CHS appropriately incentivizes geothermal heat pumps as part of the program design.

Summary of Dandelion Comments

- The CHS should credit geothermal heat pump systems at 150% to 200% of the value of air source heat pumps and other decarbonization solutions to account for the higher efficiency, lower annual electric use, and electric grid benefits provided by geothermal heat pumps.

- CHS credits should also be available to builders and developers who install heat pumps as part of new construction.

- MassDEP should ensure that any Massachusetts resident, property owner, or business who installs or leases a clean heating system is able to take advantage of the CHS credits.

[1] "*An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy*," Senate Bill 9, March 26, 2021.

Background: The Benefits of Geothermal Heating and Cooling Systems

Geothermal (or ground source) heat pumps (GSHPs) are among the most efficient ways to heat and cool buildings, according to the EPA.[2] They are also the lowest cost way for homeowners to heat and cool their homes. As such, geothermal heat pumps represent a key technology for advancing energy affordability and value, supporting the growth of the green economy, and achieving economy-wide decarbonization without meaningfully increasing peak demand.

- Geothermal heat pump systems have the potential to reduce carbon emissions from homes by 80% as compared to conventional fuel oil systems and 65% as compared to conventional propane systems[3] – and heat pump emissions will decline to zero as Massachusetts decarbonizes its electric grid.

- Residents will typically see a 40-50% reduction in total annual energy costs when switching to a geothermal heating and cooling system – factoring in both their savings in fuel and air conditioning costs they are no longer paying, and the electricity costs to run the heat pump.

- Geothermal heat pumps are about two times as efficient, and use about half the electricity, as an air source heat pump system over the course of a year. Geothermal heat pumps will also draw a peak load of only one third of an air source heat pump system.

- The increased electric demand provided by geothermal heat pumps generates savings for other electric rate-payers – a study by the New York State Energy Research and Development Authority (NYSERDA) estimated the value of this cost shift benefit to all ratepayers to be over $7,000 for each single family home electrified with geothermal heat pumps.[4]

- Geothermal heat pumps can also meet 100% of the heating needs of a home or building, without any fossil fuels or auxiliary electric heat for back-up, even in the coldest climates.

---

[2] "Geothermal Heat Pumps," Energy Star, U.S. Environmental Protection Agency, accessed March 8, 2023, https://www.energystar.gov/products/geothermal_heat_pumps

[3] Savings calculated by Dandelion and available on Dandelion's website: https://dandelionenergy.com/environmental-impact

[4] Geothermal heat pumps increase electric demand and utility revenue by far more than the additional costs of providing that electricity; this surplus is then returned to customers through lower electricity rates for all rate-payers. Geothermal systems therefore have the added benefit of effectively underwriting the electric usage of other electric customers and reducing overall costs for all consumers. This is in contrast to other renewable technologies which can reduce overall grid demand and leave other rate-payers, particularly low- and moderate-income households, footing the infrastructure bill to sustain the grid. See: *New Efficiency: New York, Analysis of Residential Heat Pump Potential and Economics*, NYSERDA, January 2019, p., S-3, https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/PPSER/NYSERDA/18-44-HeatPump.pdf

The CHS Should Prioritize Geothermal Heat Pumps for Residential Decarbonization

Given these benefits, geothermal heating and cooling should play a major role in beneficial electrification for Massachusetts. Multiple studies have shown that one in every four heat pumps installed should be geothermal to help minimize grid infrastructure costs.[5] MassDEP highlights that Massachusetts will require approximately 100,000 residential heat pump installations per year to meet its emissions reduction targets — 25,000 of those should therefore be geothermal heat pumps to help optimize for grid investments and energy efficiency savings.

To achieve these targets, the CHS should incentivize geothermal heat pump systems at 150% to 200% of the value of air source heat pumps and other decarbonization solutions.[6] This higher value would account for the higher efficiency, lower annual electric use, and resultant electric grid benefits provided by geothermal heat pumps. While both geothermal and air source heat pumps eliminate on-site emissions, they nevertheless will continue to generate emissions through electricity generation; as the electric sector works to decarbonize over the next two decades, this lower level of electric use from geothermal heat pumps will yield significant additional emissions reductions compared to other alternatives.

This higher credit generation value would be consistent with other Massachusetts incentives, such as the MassSave geothermal heat pump rebate ($15,000 compared to $10,000 for air source heat pumps)[7] and the Alternative Portfolio Standard (multiplier of 5 for geothermal heat pumps, compared to a multiplier of 3 for air source heat pumps).[8]

New Construction Credits Can Address Split-Incentives for Builders and Homeowners

CHS credits should also be available to builders and developers who install heat pumps as part of new construction, avoiding emissions that would otherwise be generated by fossil fuel systems. Providing CHS credits for new construction is particularly important as builders don't benefit from the long-term operating cost savings of electric heat pumps and are potentially less motivated to pay higher up-front cost for the most efficient equipment.

- New construction is also the optimal time to install a geothermal heat pump system, as it significantly reduces installation and design costs.

---

[5] The Brattle Group study for Rhode Island modeled 33% of heat pumps as geothermal in their mixed-fuel scenario analysis. The New York Climate Action Council Scoping Plan modeled 22-23% of heat pumps as geothermal heat pumps (see Scoping Plan, Appendix G: Integration Analysis Technical Supplement, Annex 2: Key Drivers and Outputs, December 2021, https://climate.ny.gov/resources/scoping-plan/) and the 2019 Department of Energy GeoVision analysis identified market potential for 28 million geothermal heat pumps installed by 2050 (see https://www.energy.gov/eere/geothermal/geovision).

[6] This higher incentive could be applied regardless of CHS credit calculation method, including issuing two "yardstick" residential home conversion credits for geothermal systems or using higher values for credits based on building square footage, for example.

[7] See https://www.masssave.com/residential/rebates-and-incentives

[8] "Guideline on Multipliers for Renewable Thermal Generation Units," Massachusetts Department of Energy Resources, December 29, 2017, https://www.mass.gov/doc/guideline-on-multipliers-for-renewable-thermal-generation-units-121517-final/download

- Geothermal heat pumps can serve as an important component of all-electric construction, helping to avoid line extension costs and providing savings to all ratepayers through avoided gas infrastructure.

CHS Credits Should be Available for All Clean Heat Owners and Users

MassDEP should ensure that any Massachusetts resident, property owner, or business who installs or leases a clean heating system is able to take advantage of the CHS credits. CHS program eligibility should include both homeowners and renters, with a goal of the broadest possible participation to achieve maximum decarbonization. The CHS should therefore include tenants who install clean heating systems (such as portable window-unit heat pumps) as eligible for generating and receiving credits.

The CHS should also avoid imposing any residency requirement for property owners to receive the CHS credit; residency requirements exclude landlords from taking advantage of incentive programs, but the impacts of higher energy costs and fossil fuel combustion ultimately fall on tenants. The CHS should ensure that landlords are able to participate in the CHS to provide decarbonized heating and cooling for their building residents.

To make the CHS credits accessible to low- and moderate-income households, the CHS should be available to households who lease their equipment or otherwise sign an energy service contract for electrification of their heating and cooling (in addition to households who purchase their systems outright).[9] Leasing, energy service contracts, and third-party ownership models provide an important option for ensuring that disadvantaged communities and low- and moderate-income (LMI) households are able to affordably access the benefits of clean heating and cooling.

Under a third-party ownership model for geothermal heat pumps, the system is owned by a third-party, who then either leases it, or sells thermal energy, to the consumer. Third-Party Owner leasing companies are able to reduce the price of the system by leveraging tax credits, accelerated depreciation, and lower commercial interest rates. Geothermal leasing allows a homeowner, renter, or business to receive immediate cost savings through lower energy bills without the up-front financial burden of loan financing or capital investment.

MassDEP should ensure that households who sign energy service contracts or lease agreements for heat pumps are eligible to receive CHS credits, and to assign the credits to the installer to reduce the overall cost. Credits could be provided as up-front allocations on the full value of the contract or annually based upon the yearly lease/contract costs to the household. Applying CHS credits to lease agreements will reduce the overall cost and keep the monthly payments as low as possible for eligible households.

[9] For example, the New York State tax credit for geothermal heat pump systems includes both purchases and leases in determining the basis for the credit, which include in the categories of eligible equipment "the lease of geothermal energy system equipment under a written agreement that spans at least ten years…"; see New York Tax law section 66, paragraph (g-4), https://www.nysenate.gov/legislation/laws/TAX/606, accessed February 2, 2023.

Conclusion

We are excited about the potential for geothermal heat pumps to help Massachusetts achieve its building decarbonization goals, and we look forward to working with the MassDEP as you develop the CHS program design. Thank you for the opportunity to comment.

Respectfully submitted,

Heather E. Deese
Senior Director, Policy and Regulatory Affairs
Dandelion Energy

Delivering on A promise.℠

Dead River Company

Doug Goodman VP Dead River Company Comments: DEP Clean Heat Standard

May 1, 2023

On behalf of Dead River Company operating from five locations across the state serving the home and business energy needs of over ten thousand customers, I submit the following comments to the Massachusetts Department of Environmental Protection (DEP) on their Discussion Draft Regulation and Stakeholder Discussion Document Program Design for a Clean Heat Standard (CHS) for the Commonwealth.

Dead River, through our support and involvement in the Massachusetts Energy Marketers Association, has demonstrated our commitment to not only provide warmth, comfort, and outstanding service to homes and businesses across Massachusetts, but to do so in a manner that supports improving the energy efficiency of heating oil equipment and the environmental impact of its liquid fuel. Our locations have been historically involved in selling biofuel, as well as installing heat pumps.

Through our involvement with the Massachusetts Energy Marketers Association, we have committed to being a partner with state officials to find workable, economical, and sensible solutions to reduce greenhouse gas emissions (GHG) statewide. We are also an active supplier of heating fuel provided at a discounted rate to Low Income Heating Assistance Program (LIHEAP) qualified customers.

Three specific examples of efforts by the industry to support reduction of GHG emissions that have been thwarted by state officials are below:

- The implementation of the 2008 Clean Energy Biofuels Act was scuttled by the state, resulting in more than a decade's worth progress by the industry working to reduce carbon emissions from home heating oil and on-road diesel fuel being lost.
- New York, Rhode Island, Connecticut, California, and Oregon, along with the U.S. Environmental Protection Agency recognize soy-based biofuel as an advanced feedstock, yet the DOER's APS program fails to embrace soy-based biodiesel despite empirical evidence supporting the GHG reduction capabilities of the feedstock.
- Furthermore, as opposed to supporting the accelerated use of readily available, renewable biofuels that have an immediate impact on reducing carbon emissions, the DEP, and others in state government favor electric heat pumps even though this equipment is powered by an electric grid with no

commercially defined plan for producing power from 100% renewable energy sources.

It is unsettling to us that the DEP's Discussion Draft Regulation and Stakeholder Discussion Document Program Design for a CHS represents the latest effort by Massachusetts officials to eradicate the heating oil industry and forgo options that provide choices to the consumer.

Comments on DEP's Documents

A CHS is nothing more than an escalating tax on fossil fuels to encourage "electrification" and eliminate fossil fuels for the thermal sector. The escalating tax will have a fiscal impact on homeowners and businesses across Massachusetts.

The reporting requirements being considered by DEP for both wholesale energy suppliers and retail companies are very burdensome, and if promulgated will add additional administrative costs for these companies that will be passed on to consumers by the industry.

Regarding "obligated parties" for delivered fuels (heating oil and propane) under a potential CHS, retail heating oil and propane companies should be the designated obligated parties as opposed to wholesale liquid fuel and propane suppliers. Wholesalers do not know the destination of heating oil and propane gallons once they leave the terminal gate.

The DEP's statements regarding their intent to limit credit generation eligibility to only bioenergy that is manufactured from waste feedstocks are counterproductive. Nearby states with biofuel mandates (CT, NY & RI) do not limit feedstock eligibility, and California and Oregon, the unquestionable leaders for a Low Carbon Fuel Standard, allow for soy-based biofuel in their programs. Because of this insular view on biofuel feedstocks, Massachusetts has chosen to thwart its own ability to make measurable progress in reducing GHG emissions in the thermal sector.

A potential CHS must be technology neutral and any attempt by DEP to assign zero emissions to electricity does not account for the full life cycle of electric equipment. Electricity's carbon footprint and its impact on the environment in Massachusetts must be scored along with all other energy sources that fall under a CHS.

We, like many retail heating oil companies and wholesale liquid fuel suppliers, sign fixed price contracts for supplies of heating oil up to eighteen months in advance. An escalating CHS tax on heating oil will have an impact on this standard industry practice for businesses and consumers alike. This change will have an additional impact on consumers and businesses.

Diversified Energy Specialists (DES) Comments on the Massachusetts Department of Environmental Protection Stakeholder Discussion Documents

May 1, 2023

The following comments are submitted by Joe Uglietto, President of DES.

Background

Diversified Energy Specialists (DES) is a renewable energy consulting and environmental markets trading company. DES trades in thermal energy portfolio standards in the northeast and is an aggregation in the Massachusetts Alternative Portfolio Standard, representing clients across renewable thermal technologies. DES has been working with associations throughout the Northeast and Mid-Atlantic on market-based decarbonization policy in the thermal sector, with a specific focus on Portfolio Standards, Clean Heat Standards, Low-Carbon Fuel Standards, and Cap-and-Trade programs.

Clean Heat Standard General Comments

A Clean Heat Standard is a tax on the nearly 80% of homes that use fossil fuels for heating. Referring to the CHS as anything other than a tax would be misleading. A CHS will put many small, family-owned retail delivered heating fuel companies out of business and add to the cost of heating for nearly all residents of Massachusetts. The Clean Heat Standard in Vermont is projected to add $0.70 per gallon to the cost of heating oil. Massachusetts could end up adding a tax in that range with the CHS.

If designed correctly, a Clean Heat Standard could be an excellent tool to decarbonize the building sector in Massachusetts. Unfortunately, the way the discussion document is written, the goal of the CHS is not to decarbonize the building sector in MA. The clear goal of the CHS is to electrify the building sector, not to reduce emissions. The CHS discussion document refers to the California Low-Carbon Fuel Standard and the Federal RFFs as examples that the CHS could be modeled after. Unfortunately, the CHS has not been modeled after the CA LCFS or the RFS program. Those programs are technology neutral and value greenhouse gas emissions reduction, no matter the technology that delivers them. The CA LCFS program has been successful at reducing GHG emissions from the transportation sector because it is a market-based, technology neutral program that lets the market decide how GHG reductions are achieved. The CA LCFS allows all biodiesel feedstocks to be eligible and quantifies the value of those feedstocks by the carbon intensity, using the Argonne National Laboratory GREET Model. This full-lifecycle analysis allows an accounting of the emissions and each credit generated is based on the carbon emissions avoided. Nearly half the credits generated in the CA LCFS are from biomass-based diesel and renewable diesel, while electrification is still incentivized and eligible to generate credits.

The MA CHS program design aims to control the eligible technologies, provide additional incentives for the DEPs “preferred” technology, and ignores the value of reducing greenhouse gas emissions. The CHS is not a market-based, technology neutral program that will let the market decide how emissions

36 Jonspin, Rd., Suite 233
Wilmington, MA 01887
Office: 978-245-8730 - Cell: 857-500-0385
Joe@DiversifiedEnergySpecialists.com
www.DiversifiedEnergySpecialists.com

reductions are achieved from the lowest-cost technologies. Major changes must be made to the design of the CHS to be implemented and for the state to achieve its 2030 emissions target.

Implementation Timeline

In the Discussion Draft Regulation, the MA DEP has stated that "the reporting requirements would take effect in September of 2023, beginning with a registration requirement for any heating fuel supplier that delivered heating fuel earlier in 2023." For the DEP to release a discussion document in April, have comments due on May 1, and plan to implement a program that has reporting requirements in September of 2023 and implementation in 2024 is problematic. This process has been rushed and would create a situation where most obligated parties would be non-compliant in 2024.

The burden of reporting that will be placed on many small businesses in the CHS will be significant. Most retail heating companies do not have the resources or capability to comply with or handle this type of reporting process. Due to the significant burden that a CHS will have on these small businesses, there needs to be an adequate amount of time for these companies to prepare for this compliance program.

Analyzing the heating oil sector, retailers have Fixed Price Plans and Cap Plans already in place for their customers. These plans do not account for the increased tax on fossil fuels that will result from a CHS program. These plans are written contracts that would have to be broken if a CHS were to be implemented on the stated timeline. Additionally, heating oil retailers can purchase their supply 18 months forward. They purchase this supply, and hedging, which enables them to set up these plans that benefit customers.

I strongly recommend that the CHS is not implemented in Massachusetts until 2026 or at least 18-months after a final draft of the CHS is published.

Cap-and-Invest

A Cap-and-Invest program, which is more accurately referred to as a "Cap-and-Tax" program, should not be part of the CHS program design. A Cap-and-Tax is a separate program that would provide a larger tax on consumers. As New York considers a Cap-and-Tax program, the Washington Post cited that the program would cost New Yorkers 61% more to buy a gallon of gas and 80% more to heat their homes when the program is implemented. Doreen Harris, President and Chief Executive of the New York State Energy Research and Development Authority, noted that a Cap-and-Invest program would have "a very significant impact on costs."[1]

[1] https://www.washingtonpost.com/politics/2023/04/04/new-york-citing-consumer-costs-may-ease-its-greenhouse-gas-accounting-rules/

While a Cap-and-Invest program will ensure an outcome, it will not do so in a cost-effective manner and will have a negative impact on Massachusetts residents. While the DEP views a Cap-and-Invest program as a method to generate revenue, there are better ways to generate revenue. By setting an Alternative Compliance Payment (ACP) price in the CHS, the DEP will receive a substantial amount of revenue throughout the life of the CHS. Portfolio Standards for electricity and thermal uses and Low-Carbon Fuel Standards for transportation both have ACP prices set, which generates enough revenue to pay for the administration of the program and fund programs that will invest in renewable thermal energy research and development. Typically, in RPS, APS, and LCFS programs, the ACP payments are the highest in the first years after implementation and fund the program, as well as other programs, for years to come. This can all be achieved without implementing a Cap-and-Tax program that will place an even larger cost burden on consumers.

The Clean Heat Standard is a tax on the nearly 80% of homes that use fossil fuels for heating. A Cap-and-Invest program is an additional tax. Each of these programs individually will increase the high cost of heating a home in Massachusetts. Implementing both programs will drive the middle class into climate poverty, while crippling the LMI and EJ communities.

Obligation

In the Stakeholder Discussion Document, the MA DEP has indicated that the CHS "must be set with reference to the building sector emissions sublimits established in the CECPs." The MA DEP has stated that this "would require a standard that increases in stringency by approximately 7% of reported emissions each year" from 2025 to 2030. Analyzing the Regulatory Assistance Project report on the MA CHS, the compliance obligation would be set at 29% below 1990 levels in 2025 and 49% below 1990 levels by 2030. To set a compliance obligation of 29% below 1990 levels in 2025, when the DEP has indicated that the CHS will be implemented in 2024 would be the most stringent compliance obligation in the first year of compliance of any program implemented in the United States.

Setting a compliance obligation of 29% below 1990 levels in 2025 will not only be something that the thermal sector cannot achieve but will also have a major impact on consumers of heating fuels. According to the U.S. Census Bureau's 2021 American Community Survey 5-year estimates, nearly 80% of all Massachusetts households heat their home with fossil fuels. That will mean that 80% of all residences in MA will be blindsided by the increase in heating prices from the CHS tax.

Decarbonizing any sector takes capital investment and time. When RPS programs were implemented in many states to decarbonize the electric sector in the early 2000's, the program administrators recognized that it would be a long process. Implementing RPS programs sent a market signal to electric utilities to invest in renewable electricity generation. The compliance obligation in RPS programs began small and increase at low rates annually. For example, the MA RPS Class I program was implemented in 2003. The compliance obligation on electric utilities was set at 1% in 2003. The annual increase in obligation was 0.5% from 2003-2009. From 2010 to 2019, the annual obligation increased at 1% per year. The annual obligation increased 2% from 2020 to 2024, 3% from 2025 to 2029, and by 1% in 2030 and beyond. This is the typical roll-out of a market-based program for an industry that has a goal of changing the fuels that are consumed. Looking at other states in New England, the Maine RPS program

began in 2008 and had a 1% compliance obligation that year. The compliance obligation increased by 1% from 2008 to 2017, 0% from 2018 to 2019, 3% from 2020 to 2025, and 4% from 2026 to 2030. The Connecticut RPS program was implemented in 2006 and had a 2% compliance obligation that year. The compliance obligation increased by 1.5% from 2006 to 2008, by 1% from 2009 to 2014, by 1.5% from 2015 to 2022, and by 2% from 2023 to 2030. These three portfolio standards are typical for what has been implemented around the country. These timelines have given the electric sector the time to bring renewable electric generation online and develop a plan to decarbonize their power assets. The capital investments made into renewable electric generation have taken years to come online, but they have been able to decarbonize over a 25+ year period to meet the state's 2030 emissions sublimits.

In the transportation sector, we've seen a few market-based compliance programs implemented with the goal of decarbonizing the transportation sector. The California Low-Carbon Fuel Standard was implemented in 2011 and from 2011 to 2019, the compliance obligation increased to 6.25%. The goal didn't increase to over 2% until 2016. This allowed for a 5-year period to facilitate capital investment in low-carbon transportation fuels. The goal for the CA LCFS in 2030 is 20% below 1990 levels, averaging roughly a 1% annual increase from 2011 to 2030. The Oregon LCFS aligns with the California LCFS with a compliance obligation of 20% by 2030. The Washington LCFS has set a compliance obligation of 10% below 2017 levels by 2031.

All market-based regulatory programs, whether they are Renewable Portfolio Standards in the electric sector or Low-Carbon Fuel Standards in the transportation sector, begin with a compliance obligation below 2% and an annual increase of 1% or less. This ensures that the newly regulated sector has time to make the necessary capital investments to facilitate the growth in renewable energy assets to meet the compliance obligations. Once the program has been active for 10+ years, there is typically an adjustment to the annual increase in the compliance obligation due to the renewable energy assets that have been developed and the infusion of renewable energy supply to the state.

The proposed compliance obligation in the Clean Heat Standard in Massachusetts contradicts every market-based decarbonization program in the United States. It doesn't provide the obligated parties with the time to make capital investments into renewable energy resources and to decarbonize the heating sector. Instead, it aims to tax the obligated parties at such a high rate that they will either go out of business or their customers will face such high fuel costs that they will convert to the heating technology that the MA DEP prefers, electric air-source heat pumps. If the compliance obligation in the MA CHS remains at the proposed levels, the number of small businesses that will close their doors and the number of residents that will fall into energy poverty, not being able to heat their homes, is unconscionable.

Obligated Parties

The obligated parties within the CHS should be the natural gas utilities, electric utilities, and delivered heating fuels retailers (heating oil and propane).

The obligation for the delivered heating fuels industry should be placed on the retailer, instead of the wholesaler, because there isn't a method of tracking the gallons sold from a wholesaler to an end user. Wholesalers in Massachusetts sell many gallons to retailers that are delivered out of state. If the obligation were to be placed on the wholesaler, the DEP would end up placing an obligation on wholesalers for many gallons that weren't delivered for end use within the state. Additionally, many retailers purchase fuel from wholesalers outside of Massachusetts and deliver those gallons in Massachusetts.

Electric utilities must be obligated parties under a Clean Heat Standard. Since the CHS aims to electrify the building sector, the electric utilities will gain market share over the life of the program. When this occurs, the electric utilities must be obligated to keep the obligation from reducing to the point of a market crash from the oversupply of credits. Electricity is also used in many Massachusetts households and buildings in the form of electric resistance heating. Electric resistance heating has the highest carbon intensity of any heating fuel, including natural gas, propane, and heating oil. Electric utilities should be obligated in a CHS when electric resistance heating technology is adding to the GHG emissions in the Commonwealth. It is worth noting that the electric utilities will have met their obligation of reducing emissions by 29% below 1990 levels by 2025 and by 49% below 1990 levels by 2030 through the decarbonization of the electric grid over time. Therefore, they will already be in compliance and will not need to generate credits, purchase credits, or pay the ACP to be in compliance for many years within the CHS. It will, however, be important to measure the carbon intensity of the electric grid during the winter months, rather than averaging the carbon intensity of the electric generation mix throughout the year since this is a thermal program.

Eligible Generating Technologies

Any technology that reduces greenhouse gas emissions from the thermal building sector should be eligible to generate credits in a CHS, except for fuel switching. Limiting any technologies that reduce emissions would be excluding any technologies that could provide cost-effective greenhouse gas reductions that will assist Massachusetts in meeting the 2030 emissions goal. The CHS should be a market-based, technology neutral program that allows the market to decide the most cost-effective way to reduce emissions.

The technologies that should be listed as eligible within the CHS are:

- Air-Source Heat Pumps
- Ground-Source Heat Pumps
- Biodiesel (all feedstocks)
- Renewable Diesel (all feedstocks)

- Solar Thermal
- Combined Heat and Power (using renewable electricity)
- Wood Pellets
- Renewable Natural Gas (biomethane)
- Clean Hydrogen

There should be a process to verify new technologies in a timely manner that could generate credits within a CHS as they become commercially available.

Massachusetts has programs in place that incentivize weatherization and energy efficiency measures that can reduce the energy needed to heat a home. Since these programs are already in place and rebates are given to residences and buildings that install these measures, weatherization and energy efficiency should not be eligible to generate credits within a CHS. A CHS aims to reduce the carbon intensity of the technologies that are used to heat buildings in Massachusetts. Energy Efficiency and weatherization do not reduce the carbon intensity of the fuels, rather reduce the number of BTUs that are necessary to heat a home.

The Massachusetts APS program has a rule that all eligible technologies must reduce emissions by 50% or more versus the alternative. This rule was written because the APS program does not score the carbon intensity of renewable thermal technologies. Instead, credits are generated based on the amount of BTU's generated by the technology. A technology that reduces GHG emissions by 90% would generate the same number of credits as a technology that reduces GHG emissions by 60% with the same amount of energy generated. Creating a threshold percentage for eligibility within a CHS program is not necessary since the renewable thermal technologies will be scored based on their carbon intensity and credits will be valued based on the carbon emissions avoided. I do believe, however, that fuel switching should not be eligible to generate credits in a CHS. Switching from heating oil or propane to natural gas may slightly reduce emissions, but that action should not be eligible to generate CHS credits.

All biodiesel feedstocks should be eligible in the CHS. Each feedstock will be given a separate carbon intensity score in the GREET model and each feedstock will be valued based on the GHG emissions reductions provided. Crop-based biofuels are scored accurately, accounting for ILUC within the GREET model. Limiting feedstocks to only waste-feedstocks, like in the APS program, will ensure the failure of the CHS program, and demonstrate that the DEP does not care about GHG emissions reductions and is only focused on the electrification of the building sector.

Generating Parties

The party that owns the credits within a CHS should depend on the technology. For all installed measures, the credits should be owned by the home, facility, or building owner in which the clean heat technology was installed. For example, if a homeowner or building owner were to install an air-source heat pump or ground-source heat pump system, the homeowner or building owner should be given possession of the credits. If a hospital were to install a combined heat and power plant that used renewable electricity, the hospital should be given possession of the credits.

For delivered fuels, the owner of the credit should be the retailer that delivers the renewable fuel to the end user. Like the APS program, if a retailer were to deliver a biodiesel or renewable diesel blended fuel to an end user, possession of the credit should be given to the retailer. Each retailer has thousands of customers and they can chose to deliver a renewable fuel to all of their customers and reduce greenhouse gas emissions at scale. This process should incentivize the retailer to do so. Additionally, a retailer that delivers renewable propane to an end user should be given possession of the credits. If a natural gas utility decides to blend renewable natural gas into their pipelines, which would be delivered to end users of natural gas, possession of the credits should be given to the natural gas utilities. With all delivered heating fuels, the decision to deliver a renewable fuel lies at the retailer level. That decision should be influenced by the CHS so that all heating fuel retailers make the decision to deliver renewable heating fuels and generate GHG reductions at scale. Unlike installed measures, the homeowner does not make that decision.

Actions to Meet Compliance

Obligated parties should have many avenues to meet their compliance obligation. The actions to meet compliance should include paying the ACP price, generating credits, and purchasing credits in the open market. Any other method should not be eligible.

The Regulatory Assistance Project has included an additional action to meet compliance, which is paying an appointed statewide default delivery agent. This method should not be included in the CHS. A statewide default delivery agent would be appointed by the state in a competitive process, but there would be a specific technology that would be deployed by the default delivery agent to meet the payments made. This would allow the DEP to choose a preferred technology and would hinder the CHS from being technology neutral. Additionally, there is no guarantee that the default delivery agent would be able to deploy the amount of renewable thermal technologies that would account for the total amount of GHG reductions that were paid to them. The default delivery agent could create a situation that would negatively impact the CHS and could create problems for the DEP. Replacing the Default Delivery Agent with an ACP price would be the best design.

Credit Values

GHG emissions reductions is the only way to value a credit in the CHS. 1 Ton of CO2e avoided should equal 1 credit in the CHS program. If the underlying value of a credit is anything other than GHG emissions reductions, then the program will not accomplish the goal of reducing measurable GHG emissions reductions.

All LCFS programs, which are the most like the design of a Clean Heat Standard, value credits based on GHG emissions reductions. This method ensures that the value is based on realized reductions in harmful, climate warming, GHG emissions. Measuring the value of a credit based on GHG emissions reductions also ensures that all technologies are measured equally and on the same playing field.

36 Jonspin, Rd., Suite 233
Wilmington, MA 01887
Office: 978-245-8730 - Cell: 857-500-0385
Joe@DiversifiedEnergySpecialists.com
www.DiversifiedEnergySpecialists.com

Measuring a credit based on clean heating energy supplied, which is done in the APS program, doesn't incentivize stakeholders to use the technologies with the lowest carbon intensity. If the underlying value of a credit were BTUs of clean energy delivered, there would be a range of eligible technologies with different carbon intensity scores. If a company had a choice of using an eligible technology that reduced emissions 90% or an eligible technology that reduced emissions by 60%, they would have no incentive to use the technology that reduced more GHG emissions. If the goal of a CHS is to reduce GHG emissions, then the underlying value of a credit must be GHG emissions reductions.

The way to calculate the number of credits generated from eligible technologies should be using the Argonne National Laboratory GREET Model, which provides a full life cycle analysis (LCA) of all technologies. If heating oil is given a carbon intensity score of X per gallon biodiesel is given a carbon intensity score of Y per gallon, then each gallon of biodiesel delivered should be calculated at X-Y for the GHG emissions avoided by delivering a gallon of biodiesel instead of heating oil.

When an air-source heat pump is installed, the value of the credits generated each heating season should be calculated. These credits should be given on a quarterly basis and only for the heating use of the air-source heat pump. The savings should be calculated by taking the carbon intensity of the legacy heating fuel and subtracting the carbon intensity of the winter electricity that was used to power the heat pumps in the winter heating months.

Carbon Intensity Scoring

The CHS should adopt the Argonne National Laboratories GREET Model to score all heating technologies. This is the nationally accepted and recognized method used to provide a full LCA analysis of each technology and accurately calculates the indirect land use change of heating technologies. Using any other method would indicate that the DEP prefers a specific technology and would like to create a model that scores that technology better than the nationally and internationally accepted models.

"Creating a simpler system that is appropriate for Massachusetts' focus on electrification" would not be appropriate in a CHS. Clean Heat Standards are designed to incentivize GHG emissions reductions, not to incentivize a single technology. Any method that doesn't score GHG emissions reductions and instead provides a score based on the use of a single technology will not help Massachusetts meet its 2030 emissions reductions goal and will instead provide a program that focuses on a single technology.

Electricity can not be "counted as a zero-emissions energy supply". The DEP knows that electricity is not zero-emissions and the electricity generation mix in the winter, when heat pumps are used for heating, has a higher carbon intensity than the electricity generation mix at any other point in the year. Scoring electricity as the average annual mix would be inaccurate as well.

Scoring electricity as a zero-emissions energy supply is even more concerning when considering that many households and buildings in Massachusetts utilize electric resistance heating technology. Electric resistance heating has the highest carbon intensity score of any heating technology and that should be measured, especially when there are low-carbon alternatives like air-source heat pumps available.

The DEP should use the EPA AVERT 4.0 model to perform hourly analyses of electric power emissions rates in Massachusetts during the heating months. EPAs AVERT 4.0 model can also measure avoided emission rates. This tool would give the DEP the ability to accurately measure the carbon intensity of electricity that is used during the winter to power heat pumps and provide a carbon intensity score that is accurate for Massachusetts.

It is important that the DEP consider including methane leaks from natural gas pipelines in the carbon intensity score of natural gas. Additionally, the DEP should consider the Global Warming Potential of the refrigerants that are used in air-source heat pumps.

Credit Banking

Obligated parties should have the ability to bank as many credits as they want each year. Those banked credits should have no expiration date and obligated parties should have the ability to roll those credits forward for as many years as they would like. This rule is used in LCFS programs and provides protection for an oversupply in the market. If banking was not allowed in a CHS and clean heat measures generated a surplus in credits, the price of credits in the market would crash to nearly $0 and any surplus in credits would not be sold, retiring with no value. To avoid this situation, credit banking is necessary in a program like the CHS. By allowing an unlimited amount of banking and the bank to roll an unlimited number of years, the market price of credits will remain high, even if the market is oversupplied. This is because obligated parties know that the obligation will continue to increase annually, and they must prepare for the larger obligation in future years.

Not allowing unlimited credit banking without an expiration date on the banked credits will ensure that the market price of credits will crash at some point during the life of the program. The goal of the program should be to incentivize GHG emissions reductions and allowing that incentive to crash to $0 will ensure the failure of the program.

Alternative Compliance Payment

The DEP must set an Alternative Compliance Payment (APS) price in the CHS. The ACP will ensure that obligated parties can meet their obligation if there is a deficit of credits generated in the market. The ACP will also serve as a price cap on the credits, which is a cost containment mechanism that should be encouraged in the CHS. By setting an Alternative Compliance Payment (ACP) price in the CHS, the DEP will receive a substantial amount of revenue throughout the life of the CHS. Portfolio Standards for electricity and thermal uses and Low-Carbon Fuel Standards for transportation both have ACP prices set, which generates enough revenue to pay for the administration of the program and fund programs that will invest in renewable thermal energy research and development. Typically, in RPS, APS, and LCFS programs, the ACP payments are the highest in the first years after implementation and fund the program, as well as other programs, for years to come.

The ACP should align with the social cost of carbon. 1 Ton of CO2e avoided should equal 1 credit in the CHS program and 1 Ton of CO2e avoided should be valued at the accepted value for the social cost of

36 Jonspin, Rd., Suite 233
Wilmington, MA 01887
Office: 978-245-8730 - Cell: 857-500-0385
Joe@DiversifiedEnergySpecialists.com
www.DiversifiedEnergySpecialists.com

carbon. The ACP should increase each year with the Consumer Price Index to adjust for inflation in the region.

Carve-Outs, Caps, and Tiers

The DEP suggests carve-outs for the LMI/EJ population and for electrification. I believe that any carve-out, cap, or tier in a CHS program would be unjustly favoring one technology or one group of people. The CHS would not be a market-based, technology neutral program if there were any carve-outs for specific technologies. The CHS should not be designed to ensure electrification, it should be designed to reduce GHG emissions from the building sector.

Stating that electrification measures are "long-lived" clean heat measures is inaccurate. Modeling and field tests of newer Cold-climate air-source heat pumps systems have shown that the service life is 10-years. Assuming that heat pumps have an average lifespan of 10-15 years, a heat pump system that is installed in 2025 may need to be replaced in 2035. Heating oil systems have a lifespan of 20-30 years. This "long-lived" measure will have to be replaced multiple times before 2050, leaving the homeowner responsible for the large upfront capital cost.

The purpose of a market-based, technology neutral program is to promote economic efficiency. The lowest-cost, highest GHG emissions reductions will be valued the highest. Any carve-out will increase the cost of compliance within the program and make the program less cost efficient. A carve-out for heat pumps will ensure that a technology that isn't the lowest cost and shouldn't be valued the highest within a fair market is unfairly valued.

A carve-out for the LMI/EJ population will ensure that the cost of compliance for those who don't fit into the LMI/EJ category is significantly higher. The population that qualifies for the carve-out will grow over time, due to the higher cost of compliance. The only reason that this carve-out is proposed is because the DEP wants to focus on electrification instead of GHG emissions reductions within a CHS. LIHEAP and other measures are already in place that would reduce the cost of heating for the LMI/EJ population. Insisting that there is a carve-out for this population, in addition to an electrification carve-out, will not make it possible for the LMI/EJ population to afford a conversion to a heat pump system. The only way that heat pumps will be installed in the residences of LMI/EJ is if a 100% rebate is given and they are installed for free. The cost of conversion to a heat pump system is too high for most of the population.

The Massachusetts Clean Energy Center concluded a Whole-Home Air-Source Heat Pump Pilot Program, which ran from May 2019 to June 2021.[2] The pilot program required that the air-source heat pump system must be capable of heating the entire home and be in use throughout the heating season to be eligible. For existing homes, the program only served installations displacing natural gas. For new construction, the homes could not include any fossil fuel appliances for other uses like hot water and cooking.

[2] https://files-cdn.masscec.com/Program%20Summary%20%E2%80%93%20Whole-Home%20ASHP%20Pilot%20%2002172021.pdf

On September 13, 2021, the program director, Meg Howard, provided the results of the Whole-Home Heat Pump Pilot Program.[3] There were 126 projects in the pilot from existing building retrofits, which averaged 1,674 square feet of conditioned space. The Median project cost was $20,000. The program director, Meg Howard, concluded that "Costs were higher than we hoped." Providing further analysis into the data, she stated, "Of the retrofit projects in our pilot, 25% required an electric service upgrade, while 38% reported that their natural gas heating system also provided their domestic hot water, which meant that homeowners either had to leave their natural gas boiler in place just to heat their hot water or else buy a new hot water heater as part of the project." Inflation has caused the price of air-source heat pump equipment to increase since this pilot program was completed. The cost of installing a whole-home air-source heat pump system is far above $20,000, which isn't affordable for most Massachusetts residents.

3% Customer Conversion

"Heating energy suppliers might also be required to demonstrate the conversion of approximately 3% of their customers to electric heat each year."

This one design element would single-handedly destroy the CHS. You cannot place a mandate to convert to a specific technology within a market-based program. Additionally, you are requiring obligated parties to convert their customer base to their competitor's fuel.

Not only will this face legal challenges, but it will be an impossible task for obligated parties to complete. Most obligated parties within a CHS (natural gas utilities, heating oil retailers and propane retailers) do not install air-source heat pumps. The reason that the Commonwealth has been unable to meet their electrification goals is because consumers do not want to install heat pumps and the upfront capital cost of heat pumps is too expensive for homeowners to afford. The DEP now wants to place the failure of the Commonwealth to convert homeowners to heat pump systems on the obligated parties within the CHS. Mandating that obligated parties convert their customers to heat pump systems will not alleviate the upfront capital cost of installing a heat pump system and will not convince homeowners to want to install heat pumps.

I suggest that the DEP reconsider this design element of the program. This mandate would ensure that the CHS is not market-based, technology neutral, and based in science.

Reporting

The reporting process in the CHS should be like the APS program for fuel dealers. Reporting should be biannual and should be in the fall and spring, to not interfere with the busy winter season. It should be a requirement that all reporting is done through a third-party aggregation, which is the case in the APS program, so that the reporting is accurate, streamlined, and the DEP has one contact to communicate with. There will be many obligated parties that are small businesses. These businesses will not have the

[3] https://www.masscec.com/blog/2021/09/13/masscec-pilot-showcases-success-whole-home-heat-pumps#Case_Studies

capability to handle their reporting to the DEP. Mandating that these businesses use a third-party aggregation is the only way to lower the administrative burden on the DEP and ensure that these obligated parties stay in compliance.

Organic Growth

Organic growth from a business is punished in the CHS. If the obligation placed on a company is based on the emissions from the previous year, then any organic growth from a company within an industry will face a larger obligation than the overall industry will. If an obligated party acquires customers from another obligated party within the industry, from another industry, or a customer that has built a new home, then they'll have to reduce emissions by more than the stated goal in the program, while the customers you acquired from another obligated party will ensure that other obligated party will have to reduce emissions by less. This will all occur while the overall emissions within the industry may be reduced. You cannot punish obligated parties from gaining market share within their industry in a CHS program. While there is a provision in place for any acquisition of another company, there isn't any rule in place that protects a company from being penalized for organic growth.

Weather Variability

The CHS obligation will need to account for weather variability. If there is a warm winter followed by a cold winter, the obligation will far exceed the percent reduction goal within the program. Any calculation that accounts for degree days or the weather-normalization of reported data would help to solve this problem.

Aggregations

Aggregations are vital to lowering the administrative burden of a CHS and ensuring that obligated parties are registered and in compliance. An aggregation can serve as a third-party verifier and handle the reporting of hundreds of obligated parties. They can be the primary contact for the DEP to handle any reporting issues and can ensure that the program runs smoothly. Additionally, most generators of credits and obligated parties that must purchase credits will not understand how to sell or buy credits in a market-based program like the CHS. Aggregations can buy or sell for all stakeholders, streamline the reporting process, ensure participation from all stakeholders, and provide the highest value for small generators within the CHS. The DEP should mandate the use of an aggregation for all stakeholders within a CHS program.

Interaction with Other Programs

The Massachusetts Alternative Energy Portfolio Standard (APS) already incentivizes many renewable thermal technologies which would generate credits in a CHS. The incentive from the APS is minimal and hasn't made a made a material difference in the deployment of many technologies apart from natural gas fired combined heat and power plants. Given that these plants combust fossil fuels to operate, they should not be incentivized in a CHS program.

There are some technologies that will overlap between the APS and CHS. Those include liquid biofuels, air-source heat pumps, ground source heat pumps, solar thermal, biogas, and biomass (wood pellets). I believe the DEP must work with the DOER on a solution to address these technologies being eligible in both programs. I believe there are only two viable solutions. First, to end the APS program in favor of the CHS. Second, to allow these technologies to generate credits in both programs, earning an incentive in both programs. Allowing credits generated from these technologies to choose one program or the other to sell these credits would place an undue cost burden on ratepayers or on the 80% of households that heat with natural gas, propane, or heating oil. Allowing generators from these technologies to choose which program they are eligible for would be a mistake and should not be considered.

Using an umbrella approach, which the DEP refers to in their discussion document, would not be appropriate in the APS and CHS. This would allow compliance to be met within both programs when the credits are valued differently, and prices will most likely be vastly different.

The APS only allows waste-feedstocks for biofuels to be eligible. This is one piece of the APS program which should be abandoned in the CHS. Waste-feedstocks, which include used cooking oil and animal fats, do not have sufficient supply to support a CHS program. The number of credits generated from waste-feedstocks in the APS has been declining for the last few years due to lack of supply. In 2022, only 13.1M gallons of biodiesel from waste feedstocks were minted in the APS program. Given that the number of heating oil gallons used in Massachusetts is nearly 700M, the potential impact of waste-feedstocks is minimal at best. Waste feedstocks cannot be scaled and do not have the potential to decarbonize the liquid heating fuels sector in Massachusetts.

Clean heat measures that are deployed before the CHS takes effect will be incentivized in the APS program. Since there is already a thermal Portfolio Standard in place in Massachusetts, there is no need to allow retroactive generation of CHS credits prior to the program beginning.

36 Jonspin, Rd., Suite 233
Wilmington, MA 01887
Office: 978-245-8730 - Cell: 857-500-0385
Joe@DiversifiedEnergySpecialists.com
www.DiversifiedEnergySpecialists.com

Conclusion

The CHS design document as written is not a market- based GHG emissions reduction program. Unlike LCFS programs, the goal of the CHS is to install electric heat pumps in every household and building in Massachusetts, not to reduce GHG emissions at the lowest cost to customers.

The CHS is a large, escalating tax on nearly 80% of residences in Massachusetts. To avoid the large, escalating tax that is created by the CHS, homeowners will have to convert to heat pumps. Unfortunately, heat pumps cost well above $20,000 to install and most homeowners in Massachusetts cannot afford them. Therefore, the CHS is simply a large, escalating tax that will harm homeowners and small businesses throughout the state.

To make the CHS a workable program, the DEP needs to materially change the design of the CHS. To ensure the success of a CHS, the most important changes that the DEP needs to make are as follows:

1. Lower the compliance obligation to 5% in 2025, escalating to 10% in 2030.
2. Remove the provision that mandates 3% of each obligated party's customer base convert to electric heat pumps each year.
3. No carve-outs, caps, or tiers within the CHS.
4. All technologies that reduce GHG emissions are eligible, including all biodiesel feedstocks.
5. Use the Argonne National Laboratory GREET model to score heating technologies.
6. Scoring electricity with the EPA AVERT 4.0 Model on a seasonally adjusted basis.
7. The underlying value of 1 CHS credit should be 1 Ton of CO_2e avoided.
8. Ensure that the program is market-based and technology neutral, leveling the playing field and valuing GHG emissions reductions.
9. Eliminating the APS program or allowing eligible technologies to double dip in the APS and CHS.
10. Setting an ACP price and allowing unlimited credit banking for obligated parties.
11. Mandate the use of aggregations for all stakeholders in the CHS.

36 Jonspin, Rd., Suite 233
Wilmington, MA 01887
Office: 978-245-8730 - Cell: 857-500-0385
Joe@DiversifiedEnergySpecialists.com
www.DiversifiedEnergySpecialists.com

Environmental Defense Fund

Massachusetts Department of Environmental Protection
100 Cambridge Street, Suite 900
Boston, MA 02114
Re: Massachusetts Clean Heat Standard Stakeholder Input

May 01, 2023

Dear Commissioner Heiple,

Environmental Defense Fund ("EDF") appreciates the opportunity to comment on the clean heat standard discussion document and the draft regulation emissions reporting requirements for heating fuel suppliers[1] developed by the Massachusetts Department of Environmental Protection ("MassDEP"). As an initial matter, EDF notes that the discussion document only provides a brief background and description of the proposed clean heat standard, and the straw recommendations are technically complex. While the documents provided by MassDEP start the discussion for those who have familiarity with the issues, others may not be able to participate due to a lack of information. The brevity of the background information along with no opportunity for questions and answers to better understand the importance of a clean heat standard ("CHS") prior to the deadline for the submission of comments does not promote the principles of equitable stakeholder engagement. A clean heat standard will have implications for all citizens of the Commonwealth and meaningful opportunity to engage must be provided. As the Massachusetts Decarbonization Roadmap makes clear, "broad and sustained public engagement during policy and program development, particularly with EJ populations, communities of color, and low-income residents, will not only be necessary to avoid inequitable outcomes, it will be a key step in achieving a Net Zero future."[2] At a minimum, MassDEP must hold workshops regarding the clean heat standard to provide level-setting information that can be easily understood. Since the clean heat stakeholder process is just beginning, MassDEP should take immediate steps to outline an engagement strategy that will ensure inclusivity. In its engagement strategy, MassDEP must allow adequate time for stakeholders to work through the issues including providing adequate notice relative to when each topic is going to be discussed and allowing adequate time for stakeholders to prepare for the discussions. In addition, EDF supports the use of technical sessions for topics outlined by Conservation Law Foundation and the drafters and signatories to those comments.

In this comment letter, EDF raises some high-level considerations and will engage in more detailed discussions as the stakeholder process goes forward. Under Topic #1 – "Setting the Standard" MassDEP poses the question as to whether the CHS should be supported by a separate declining cap on emissions to ensure emissions outcomes, such as a "cap-and-invest" program for the building sector.[3] In light of the climate goals in Massachusetts, an emissions cap can provide an important backstop to ensure that the state's targets for covered sources are met. An enforceable cap on emissions can work alongside reporting requirements and incentives to provide

[1] MassDEP refers to the draft regulations as "straw" regulations. Draft regulations at 1
[2] Massachusetts 2050 Decarbonization Roadmap at page 17 (December 2020), https://www.mass.gov/doc/ma-2050-decarbonization-roadmap/download
[3] Discussion Document at 5

a high level of environmental certainty that overall emissions goals for regulated entities are achieved. The reporting requirements laid out in MassDEP's draft regulations can provide important information to enable climate action but must be paired with real requirements for polluters to cut greenhouse gas emissions at the pace and scale needed to achieve the state's climate targets and protect Massachusetts' families and communities from the most dangerous impacts of climate change. MassDEP and stakeholders can look to established emission cap programs in California, Washington and Oregon for guidance.

The discussion document raises the question of whether there are cases where "double dipping" to earn incentives from multiple programs should be prevented, or possibly encouraged such as to support LMI energy consumers.[4] It is possible that in certain cases double dipping of incentives could benefit LMI communities. The discussion around this issue is not only in what cases it will be appropriate to do so, but also how do we ensure that double dipping does not also lead to double counting of emission reductions.

In the draft regulations, MassDEP poses the question whether in structuring reporting requirements for delivered fuel should any exceptions or special requirements be included, such as for cooking fuel or for synthetic fuels such as "renewable diesel".[5] EDF has concerns with an exception for synthetic fuels. Synthetic fuels is a broad term and "depending on the context methanol, ethanol and hydrogen may also be included in this category."[6] Hydrogen is a short-lived, indirect greenhouse gas that has global warming potential.[7] When emitted into the atmosphere, hydrogen contributes to climate change by increasing the amounts of other greenhouse gases including methane, ozone and water vapor, resulting in indirect warming.[8] In addition, hydrogen's warming effects are most potent in the decade after it's released. But scientists and policymakers almost always report only the 100-year warming power from a single pulse of emissions – masking the near-term impact.[9] If the Commonwealth intends to reach its climate goals, it cannot overlook that the relative warming impact from *continuous* instead of pulse emissions of hydrogen is 100 times more potent than CO2 emissions over a 10-year period (for equal emissions annually during this time).[10]

Research is showing vastly different climate outcomes depending on both time horizon and the leak rate when comparing clean hydrogen's impacts to that from the fossil fuel applications it is replacing. In high leakage scenarios, significant hydrogen emissions could yield nearly twice as much warming in the first five years after fuel switching compared to its fossil fuel counterparts.[11] With moderate leakage, even what has been termed "green hydrogen" could increase near-term warming.[12] On the other hand, if leak rates are minimal, hydrogen could yield an 80% decrease in warming in the first five years compared to its fossil fuel counterparts.[13] To maximize climate

[4] Discussion Document at 10
[5] Draft Regulations at 9
[6] https://www.sciencedirect.com/topics/engineering/synthetic-fuel#:~:text=synthetic%20fuel%20A%20generic%20term,oil%20is%20a%20synthetic%20fuel.
[7] Global Environmental Impacts of the Hydrogen Economy, https://www.geos.ed.ac.uk/~dstevens/Presentations/Papers/derwent_ijhr06.pdf
[8] Climate consequences of hydrogen leakage (2022), https://acp.copernicus.org/preprints/acp-2022-91/acp-2022-91.pdf
[9] *Id.* at p. 1
[10] *Id.* at p. 6
[11] *Id.* at p. 1
[12] *Id.* at p. 19
[13] *Id.* at p. 1

benefits over all time frames, the total lifecycle leakage rate for hydrogen should be 1% (i.e., from production through end use) although this ceiling may be adjusted based on continuing research.[14]

In addition to the need for a greater understanding of hydrogen's warming impacts at different possible leakage rates, MassDEP must also carefully weigh the safety and operational considerations, especially with blending hydrogen into the gas system for residential heating. There are at least three major reports that address the safety of hydrogen blending with natural gas, examining pipeline and infrastructure integrity as well as compatibility with end-use technology. An NREL study (2013) claimed 20% is a safe threshold.[15] More recently, a UC Riverside study (2022) states that "systemwide blending injection scenario becomes concerning as hydrogen blending approaches 5% by volume,"[16] and a Fraunhofer Institute (2022) report indicates that there is no established limit value for hydrogen when blending, and that it depends on a case-by-case basis.[17] The findings of these studies, at the very least, counsel for a precautionary approach to "synthetic fuels" in order to ensure that such fuels are a safe alternative and in fact have a climate-positive impact. Therefore, unless there are accurate ways to measure the leakage rates of hydrogen and synthetic fuels, allowing exceptions in the clean heat standard to use these fuels could move the Commonwealth away from meeting its climate goals.

Respectfully submitted,

Jolette Westbrook,
Dir. & Sr. Attorney Equitable Regulatory Solutions
Environmental Defense Fund
18 Tremont Street, Suite 850
Boston, MA 02108
(617) 406-1838

[14] *Id.* at p. 10. Biomethane similarly has uncertain benefits and poses risks of increased emissions. A molecule of methane – even from a renewable source – contributes much more to the rate of climate change than a molecule of carbon dioxide. A peer-reviewed study in 2018 found that a small distribution system loss rate of 3% can negate the climate benefits of replacing fossil natural gas with biogenic CH4 generated from new sources over a twenty-year horizon. Alvarez et al, Assessment of Methane Emissions from the U.S. Oil and Gas Supply Chain, *Science* (July 2018), available at https://science.sciencemag.org/content/361/6398/186. *See also* A Framework for Gas Company Climate Planning in New York, MJ Bradley and Associates (May 2021) available at https://www.edf.org/sites/default/files/documents/MJBA_A%20Framework%20for%20Gas%20Company%20Climate%20Planning%20in%20New%20York_FINAL.pdf

[15] Melainia et al, Blending Hydrogen into Natural Gas Pipeline Networks: A Review of Key Issues at viii (March 2013), https://www.nrel.gov/docs/fy13osti/51995.pdf

[16] University of California, Riverside, Hydrogen Blending Impacts Study at 4 (2022), *available at* https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M493/K760/493760600.PDF

[17] *Riemer et al., Future hydrogen demand: A cross-sectoral, global meta-analysis (April 2022), available at* https://publica.fraunhofer.de/entities/publication/e4910b11-a81d-4c4d-8845-9ea36141a655/details

EVERSOURCE ENERGY

May 1, 2023

VIA EMAIL

Massachusetts Department of Environmental Protection
ATTN: Commissioner Bonnie Heiple
100 Cambridge St, Suite 900
Boston, MA

Re: Clean Heat Standard Design

Dear Commissioner Heiple:

Eversource Energy ("Eversource") is appreciative of the important efforts of the Massachusetts Department of Environmental Protection ("MassDEP") to examine the future of clean heat in the Commonwealth of Massachusetts and the need to identify opportunities to achieve the clean energy transition to enable sector-wide decarbonization while mitigating cost impacts for the Commonwealth's energy customers. Eversource is committed to the essential public-policy objective of ensuring the availability of safe, reliable energy, while mitigating public health and environmental impacts attendant to such energy use, including reduction of greenhouse gas ("GHG") emissions and emissions of criteria air pollutants.

Eversource fully supports MassDEP's direction to include strategies to: (1) provide for more affordable heating and cooling for Massachusetts residents and businesses; (2) achieve sufficient reductions in GHG emissions from residential and commercial buildings and industrial facilities to enable the Commonwealth to meet statutory requirements and the economy-wide GHG reduction mandates signed into law and policy targets for 2025, 2030 and 2050 established in the CECP; and (3) improve the resilience of the Commonwealth's energy sector to extreme weather events, fuel commodity price spikes and other disruptive forces.

Eversource looks forward to participating in the stakeholder process and to provide input on the Clean Heat Standard Program Design. To that end, Eversource offers the following comments to MassDEP for consideration. As set forth below, a key point for the development of any program with the goal of achieving verifiable GHG emissions reductions through a portfolio of technologies is basing these reductions on *avoided* emissions achieved through the implementation of clean technologies, thereby providing for customer choice and an integrated approach to the clean energy transition. An integrated approach will maximize efficiency and mitigate costs to customers, most particularly for low-income customers, while maintaining safety, resiliency, and reliability. These interrelated aspects are critical components of the transition and should be addressed through a well-considered, transparent and successful stakeholder process. These key points are discussed in detail below.

Importance of Providing Customer Choice and Remaining Technology Agnostic

The Commonwealth should ensure that any standard or program established as the Clean Heat Standard Program Design should be squarely focused on emissions reductions, while remaining technology agnostic. Verifiable reduction of GHG and critical air pollutants is the fundamental, pivotal goal for the Commonwealth and the full range of technological options that would achieve verifiable emissions reductions should be considered without qualification or pre-judgment. For example, eligible verified emissions reduction projects should include air source and ground source heat pumps (either individually or networked) and bioenergy derived from waste feedstocks with zero to negative emissions. New options, such as hydrogen and advanced biofuels, should also be evaluated and contemplated, following the establishment of a standardized and verifiable carbon-accounting method.

By remaining technology agnostic, Eversource will be in a position to offer customers a broader array of choices to decarbonize their energy use. Providing customer options will also allow individual customers or customer groups to reduce emissions more efficiently. The customer types from residential to large industrial have unique requirements that may be served in different ways. Having a portfolio of decarbonized options will provide the flexibility to offer individualized options that can be elected by the customer at the best cost fit and remain flexible for future technological advancements.

Stakeholder Process

MassDEP has put forth specific topics and questions for stakeholder comment, in the categories of: (1) Setting the Standard; (2) Regulating Heating Energy Suppliers; (3) Credit Generation; (4) Compliance Flexibility and Revenue; (5) Reporting Requirements for Heating Energy Suppliers; (6) Interactions with Other Programs; and (7) Economic Analysis. Within these various categories, the following topics should be considered consistent with discussions conducted by the Clean Heat Commission:

- Customer adoption rates, workforce availability and electric grid capacity;
- Cost analysis and life-cycle emissions tracking to ensure overall GHG reductions and cost implications, particularly to low-income customers and environmental justice communities;
- Larger regional energy challenges, such as supply constraints and increased severe weather, which are critical to factor in for successful deployment; and
- Overall applicability of the Clean Heat Standard to certain suppliers in light of recent legal decisions.

These topics should be addressed methodically through a meaningful stakeholder engagement process that first identifies and includes the broad base of interested stakeholders, including heating suppliers, small and large commercial customers, industrial customers, utility workers, low-income advocates, environmental justice communities and municipalities. The process should then solicit feedback from these interested stakeholders through various

engagement opportunities including periodic in-person or virtual meetings, working technical sessions and educational materials.

In particular, MassDEP should:

- Identify a clear and inclusive stakeholder process designed to integrate input from a broad range of interested stakeholders with multiple, scheduled opportunities to comment and provide feedback, along with regular communications to notify interested parties of meetings and deadlines.

- Identify the portfolio of data that needs to be captured and establish how that data will be transparently shared with interested stakeholders.

- Retain an independent consultant to support and facilitate the stakeholder process. Charge the independent consultant with responsibility for holding monthly meetings, special-issue workshops, and one-on-one conversations to move the agenda forward. Require the independent consultant to prepare a final report documenting the stakeholder process and fairly representing the opinions and recommendations put forth therein.

- As the draft regulations are developed, continue to provide opportunities for notice and comment on straw proposals prior to release within a formal rulemaking process.

Eversource is deeply committed to its customers in the Commonwealth of Massachusetts and Eversource views achievement of the Commonwealth's critical public policy goals relating to emissions reductions as a fundamental component of the privilege of serving Massachusetts customers. Accordingly, Eversource looks forward to participating in the clean energy transition as an engaged productive partner and appreciates the opportunity to comment on the development of the Clean Heat Standard Program Design as part of that transition.

Sincerely,

Nikki Bruno

Nikki Bruno
Vice President, Clean Technologies

FALMOUTH ENERGY
A CENTURY OF ENERGY SOLUTIONS

April 27, 2023

Massachusetts Department of Environmental Protection
100 Cambridge Street
Suite 900
Boston, MA 02114

Re: Clean Heat Standard Stakeholder Process

To whom it may concern:

I write to you today as a stakeholder regarding the proposed Clean Heat Standard for the Commonwealth. I am the owner of Falmouth Energy in Falmouth, Massachusetts. We are a small (10 employee) family business that has been heating and servicing homes in Barnstable County for over 130 years. Our focus is providing energy solutions for our customers through the installation of high efficiency heating and hot water systems, delivering advanced Biofuels, and installing ductless heat pumps.

In the 20 years I have been involved in this industry we have made a tremendous reduction in the environmental impact from the systems we install and the liquid fuel we deliver. When I started, the fuel we delivered was a high sulfur (2,000 ppm) #2 fuel. I am excited to say that our customers now receive fuel that is ultra-low sulfur (under 15 ppm) and contains 20% renewable biodiesel (B20). We are committed to a cleaner heating future and have already made a significant impact in reducing carbon emissions in Barnstable County and the Commonwealth and we are on track to provide our customers a carbon free liquid fuel well ahead of 2050.

The proposal of the Clean Heat Standard put forth from the Massachusetts Department of Environmental Protection is of deep concern for its impact on my business, employees, customers, and on the tremendous strides we have made, and continue to make, to meet the Commonwealth's goals to reduce green house gas emissions.

Some of these concerns are as follows:

- The proposed Clean Heat Standard (CHS) is an escalating fuel tax with the end goal of eliminating customer choice and electrification being the only option. This is not a "cost-effective policy tool".

FALMOUTH ENERGY
A CENTURY OF ENERGY SOLUTIONS

- The proposal of a CHS could put forth an unequitable and overly burdensome compliance requirement to a small business like ours. We do not have extensive computer capabilities or back office staff to track credits and report emissions of our customers.

- The proposal suggests not using the GREET model for applying credit values and GHG emissions in a Clean Heat Standard. The GREET model is the state of the art method for full life cycle analysis for transportation and heating fuels, advanced biofuels, and the electric grid. Creating a new model with the sole purpose to help support electrification just further reinforces the elimination of consumer choice in reducing GHG emissions.

- The proposal seeks to limit credit generation to only "bioenergy that is manufactured from waste feedstocks" and the continued reluctance to allow soy-based biofuel to help Massachusetts reduce carbon emissions. This illogical thinking perpetuates despite the fact that advanced biofuels are endorsed and approved by the U.S. Environmental Protection Agency, and empirical evidence that supports the GHG reduction capabilities of the feedstock. The only reasoning behind this appears to be mandating electrification as the only option.

- The proposal suggests a possible requirement to convert 3% of our customers to electric heat each year. Mandating my business to force customers to convert from their current path of reducing green house emissions to one dictated upon them is not acceptable. Our customers have the right to decide the product that suits them best to reach required reductions in green house gas emissions.

I hope these concerns are heard and that an equitable solution will be found that ultimately allows the consumer to decide the heating sources they will use to meet required reductions in GHG emissions. Mandating electrification as the only solution is short sighted and unjust for the residents and small businesses of the Commonwealth of Massachusetts.

Sincerely,

Christopher LeBoeuf
President
Falmouth Coal Co., Inc.

FRANK LAMPARELLI

GAS • PROPANE • HVAC • OIL • DIESEL

1026 Turnpike Street · Canton, MA 02021 · *Tel:* 781-828-2477 · *Fax:* 781-821-4051

4/28/2023

Massachusetts Department of Environmental Protection
100 Cambridge Street Suite 900
Boston, MA 02114

To Whom It May Concern,

I am writing to voice my serious concern regarding the recent Clean Heat Standard development that the Massachusetts DEP has established without any legislative authority.

If I am to understand, you are proposing a fossil fuel tax on all gallons delivered. How can the DEP create a tax without approval from the governing body in the Commonwealth? I think if you speak with the general population and all my clients, most are going to be against this new tax. I know I am.

Also, how do you arbitrarily establish a mandate of converting 3% of our 4500 loyal clients, of all different financial status, to purchase expensive heat pump equipment. How are we supposed to force our clients into this change? Tell 3% of our clients we cannot service them anymore. Ridiculous.

Your suggestion of eliminating specific types of bio diesel to minimize our ability to provide our customers a "net zero" carbon fuel for all our clients is another shameful attempt to eliminate our industry from being part of the solution of clean energy and a solid climate plan.

Lastly, Frank Lamparelli Oil has been an active, ongoing entity paying our fair share of taxes to the Commonwealth of Massachusetts since this family business began in 1929. We have always supported our clients, our community, the Commonwealth of Massachusetts and a cleaner environment. Let us continue to do so.

Sincerely,

John P. Mullaley
General Manager
Frank Lamparelli Oil Co., Inc.
1026 Turnpike Street
Canton, MA 02021
info@franklamparelli.com

FSi Oil and Propane
Comfort Delivered. Value Guaranteed.

Massachusetts Department of Environmental Protection
100 Cambridge Street
Suite 900
Boston, MA 02114

RE: Clean Heat Standard Stakeholder Commentary

To Whom It May Concern,

Today I write to you as a stakeholder regarding the proposed Massachusetts Clean Heat Standard. I am the President FSI Oil and Propane, Inc. headquartered in South Hadley, MA serving 23 communities and (15,000 Customers. We have been in business for 34 years.

My company sells deliverable fuel (heating oil, propane, biofuel, diesel, kerosene) and provides HVAC and home comfort service to many Massachusetts communities that would be affected by the proposed MA Clean Heat Standard. I write this letter today with grave concerns about implementation of the MA Clean Heat Standard ("CHS"), not only for my business and its employees but for all Massachusetts residents and consumers of delivered fuels in the state as well.

The poorly written CHS rule-making calls into question the seriousness and professionalism of its architects and their grasp of basic Massachusetts Consumer Protection and Business law. It raises serious questions of their motivations regarding the lack due diligence to assess the economic and operating impacts of the CHS on MA small businesses and MA consumers this standard will surely affect. Some concerns:

- The omission of renewable fuels in the form of renewable propane, renewable diesel and renewable heating oil and gasoline tells us that there has been no consideration of their contribution to achieving climate goals. The fact that renewable fuels go wholly un-addressed in this rulemaking is a serious omission and tells us that the rulemaking process is deeply flawed to begin with. If the goal of this clean heat standard is truly to reduce climate impact, all alternative renewable fuels must be considered under the CHS as literature has proven these fuels will be less carbon intensive and are an IMMEDIATE reduction in CO2 and atmospheric carbon ***and ARE ALREADY*** being delivered withing the state by the businesses that the CHS is attempting to regulate.
- Another un-addressed solution to reduce the climate impact of hydrocarbon fuels in the state immediately is expanding the Massachusetts Alternative Portfolio Standard to include all bio- related feedstocks. Currently it is relegated to cooking fats only and acts as a bottleneck on an easily achievable carbon reducing strategy. We would like to see expansion of the APS to include those feedstock types that the USDA ***ALREADY*** creates approved RINS for. All renewable forms of energy must be included or addressed in the rulemaking, yet NONE of this was considered in the CHS.
- This rule making creates its own Massachusetts model for calculating and scoring carbon intensity and does not use the industry and globally accepted GREET method for calculating carbon intensity. Why is it that we are creating our own (potentially flawed) carbon calculator specific to MA? The proposed carbon calculation contribution is not an industry standard nor close to any previous modelled calculation in current literature.

- Electric generation using hydrocarbon fuels by utilities is not scored in the CHS and seems to be exempt from this rulemaking. It seems curious that such a large atmospheric carbon contributor is wholly left out from the CHS rulemaking. Why is electricity generation from fossil fuels exempt from this rulemaking if the goal is to reduce emissions and be compliant with our climate goals for the state? Why should an out of state utility delivering electricity to Massachusetts residents be considered any different than a small Massachusetts energy dealer delivering fuel to the same homes?
- There are many issues yet brought up, but unresolved, in the proposal for out-of-state fuel dealers and companies that may be headquartered outside of the state of Massachusetts but deliver fuels to Massachusetts residences. Conversely, businesses within Massachusetts that deliver outside of the state are a separate un-addressed issue as well. These issues are partially addressed but wholly inadequate as written to seriously think about implementing at this time.
- The Clean Heat Standard proposed carbon reduction calculations penalizes dealers in arrears for what has already happened in the previous years' business operations. It has the effect of limiting (read: punishing) organic growth of these family businesses within the state.
- The self-reporting regulations are burdensome to small businesses. Many fuel dealers are smaller family businesses without the resources or capacity to comply with increased administration and regulatory issues.
- The proposal is written without a real method for oversight and regulation and without penalty for non-compliance. There are zero provisions for state enforcement or regulation, or compliance contained in the standard as written.
- To require retail heating oil and propane dealers to convert 3% of their customer base annually to electric heat pumps is an anti-competitive practice and possibly in violation of a number of constitutionally protected rights of business to operate within the state.
- To require forced conversion from one fuel source to another or rules that favor one heating system over another infringes upon Massachusetts' Consumer Protection Act and rights.
- In addition to completely ignoring many consumer protection laws, we believe many of the measures as written in the CHS oversteps MA DEP's legal operating purview and therefore would expect the state to be on the receiving end of a number of lawsuits for the CHS as written.

Simply put, the Massachusetts Clean Heat Standard has many obvious flaws, is not well researched and lacks the basic understanding of business and consumer protection laws in the state of Massachusetts. The CHS regulations, as written, place undue economic and regulatory burden on Massachusetts residents, consumers and small businesses within the state. It's contribution to achieving the climate goals of the state is extremely unclear and unquantified. It's lack of a study on the potential economic impact on Massachusetts consumers and small businesses should make it a clear non-starter. **I strongly urge you to not enact the MA CHS rules until a comprehensive study with adequate public input looking at economic, energy security, fairness across ALL hydrocarbon users is completed.**

I remain optimistic that with enough consideration, due diligence and planning that a MA Clean Heat Standard that makes sense for all and contributes to achieving the MA climate goals can be implemented in the future.

Sincerely,

Stephan C Chase

FUEL MANAGEMENT SERVICES, INC.

WWW.FUELMANAGEMENTSERVICES.COM

13 Main Bayway
Toms River, NJ 08753
Phone 732-929-1964
Fax 732-929-2925
Cell 908-625-6239

Dear MA DEP, 4/27/2023

I am writing to voice opposition to the proposed CHS in MA. My company, Fuel Management Services, Inc. supports heating fuel dealers in MA and many other states to provide a reliable, safe and economical form of heating for over 30 years. Our business, located in NJ, serves dozens of heating fuel dealers in the state of MA who in turn serve tens of thousands of homeowners who heat their homes with modern biofuel home heating fuel. As an environmentalist at heart, I understand the need to transition away from petroleum fuels. Our industry is reducing petroleum use at an impressive pace and reducing greenhouse gases.

As the liquid heating fuel industry transitions to higher blends of renewable biofuels, the path forward to carbon neutral is already in play. In fact, the carbon reductions taking place in our industry as I write this are already significant. The costs to homeowners and the many multi-generational family owned and operated liquid fuel delivery businesses in MA if the CHS takes precedent will be staggering. Small business is the backbone of every state economy, and the GHS will surely break this backbone and the good people of MA will all suffer economically. Heat pumps are not the answer to a reliable source of home heating from a cost and functionality standpoint.

Our liquid heating fuel is part of the green, carbon reducing solution and not the problem policymakers are making the fuel and the heating fuel industry out to be. The industry infrastructure has been in place for many years, proving to be an efficient and cost-effective home heating solution. Biofuels are part of the low cost solution, and the liquid heating fuel industry deserves to be part of the policy making process to carbon reduction. Our industry has provided and continues to provide factual information regarding our carbon reduction progress to date and what we have to offer for the future. And that future is a carbon free liquid heating fuel in less than 15 years.

I implore the policymakers in MA to take the time to listen to our industry leaders and stakeholders as to the steps we've taken already and the clear path in place to carbon reduction in the near future. Thank you.

Mark J. Stellmach
President
Fuel Management Services, Inc.

GLOBAL PARTNERS LP, 800 South Street, Suite 500, P.O. Box 9161, Waltham, MA 02454-9161

May 1, 2023

Secretary Rebecca L. Tepper
Executive Office of Energy and Environmental Affairs
100 Cambridge St #900
Boston, MA 02114

CC:
Bonnie Heiple
Massachusetts Department of Environmental Protection
100 Cambridge St #900
Boston, MA 02114

RE: Comments to the Massachusetts Clean Heat Standard (CHS)

Dear Secretary Tepper,

Global Partners LP (Global) appreciates the opportunity to present comments on the Massachusetts Clean Heat Standard. As one of the Northeast's largest independent suppliers and operators of liquid energy terminals, retail fuel stations, and convenience stores, reliability and quality service are key to everything we do. We are proud to support the communities where we live and work. Our efforts to be a good neighbor began more than 75 years ago, when our company began delivering home heating oil – door to door – in the neighborhoods around Greater Boston.

We are proud to serve the energy needs of people and businesses within the Commonwealth through our terminal locations in Sandwich, Chelsea, and Revere, and at our retail locations, consisting of over 400 owned and supplied fuel stations throughout the Commonwealth. We are headquartered in Waltham and proudly employ over 1,500 workers in the State. Through our existing energy infrastructure, we are able to deliver vital liquid fuel to meet the energy needs of almost seven million residents in the State. At the same time, we are committed to improving sustainability and reliability across the value chain of our business operations. As such, we believe Global is uniquely positioned to provide commentary concerning Massachusetts energy policy and help the state meet its climate goals.

Global generally supports the principles of the Global Warming Solutions Act of 2008, which requires a 25% reduction in greenhouse gas (GHG) emissions from all sectors of the economy below the 1990 baseline emission level in 2020 and at least an 80% reduction in 2050.[1] As part of this pursuit, Global is also invested in meeting state greenhouse gas emissions reductions in a way that is consistent with the Massachusetts Clean Energy and Climate Plan for 2025 and 2030.[2] Through this framework,

[1] Department of Environmental Protection. An Act Establishing the Global Warming Solutions Act. Massachusetts Legislature, https://malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter298. 193rd General Court of the Commonwealth of Massachusetts, Chapter 298, Acts (2008), approved August 7, 2008.
[2] Executive Office of Energy and Environmental Affairs. Massachusetts Clean Energy and Climate Plan for 2025 and 2030, June 30, 2022, https://www.mass.gov/doc/clean-energy-and-climate-plan-for-2025-and-2030/download

Massachusetts has an opportunity to make early contributions to decarbonization efforts and minimize costs to residents through smart policy design.

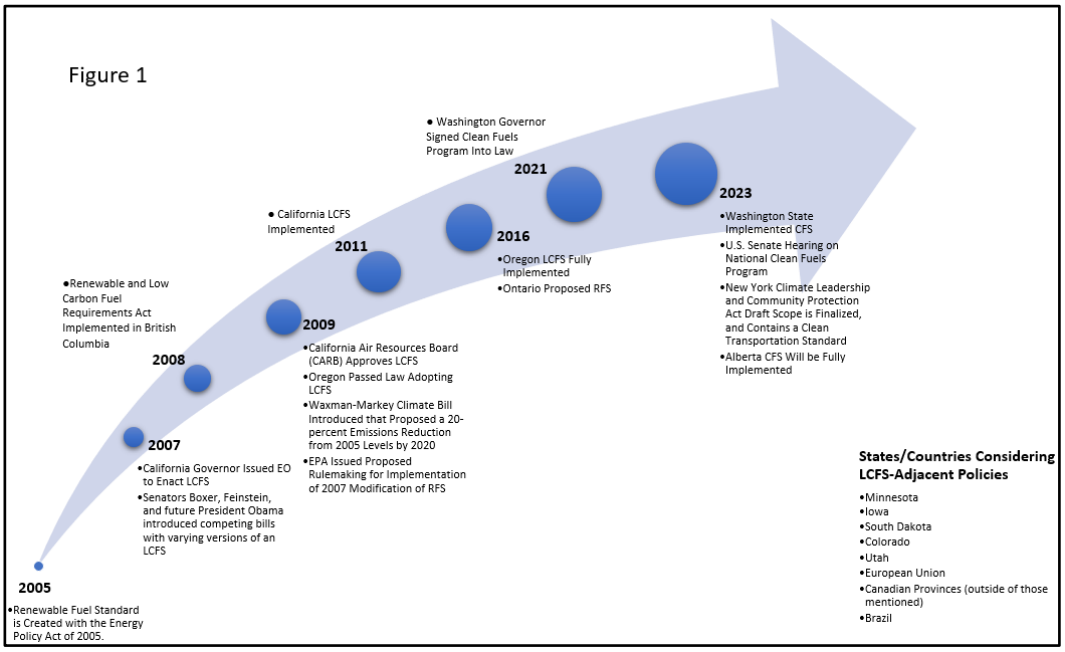
Early contributions to decarbonization are critical because of the concept of the Time Value of Carbon (TVC).[3] Due to the cumulative effects of carbon, emissions reductions today are a better mitigation tool than addressing concerns in the future. To effectively accomplish emissions reductions today, smart CHS policies are essential. Smart CHS policy design includes: clear and transparent compliance obligations, credit flexibility and transparency, feedstock neutrality, and an accounting framework that addresses carbon emissions from every source.

Our comprehensive view is that emission reduction goals are best accomplished through performance-based programs, like the California Low Carbon Fuel Standard (LCFS), that avoid specific technology choices. Open competition to deliver the cleanest fuels at the lowest cost will help minimize the cost burden on citizens during this transition. In addition, utilizing and recycling existing infrastructure for decarbonization can help mitigate the need to build out costly electrification infrastructure (grid, transmission, and end users). Prescriptive policies that try to pick the technologies of the future may eliminate the option of more cost-effective choices to meet currently available GHG emissions goals, thus harming the State and its residents.

Global believes that clarifying compliance obligations will help ensure program success. First, the point of obligation should be placed on the entity that brings fuel into Massachusetts, whether such an entity is a wholesaler, terminal operator, or retailer. This structure avoids compliance uncertainty for stakeholders and may galvanize earlier action by clarifying responsibility for emissions reductions. For example, without including retailers, a dealer could load up in another state and drive across the border to sell product that avoids CHS if CHS is only targeted at larger operators (like wholesalers and terminals). If such an instance were to occur, it would undermine the CHS objectives and place wholesalers and terminals at an unfair competitive disadvantage. Clarity will also enable better supplier planning, which will be critical for delivering lower carbon fuels to the State sooner rather than later.

Next, flexibility in credit acquisition and eligible measures is an important design consideration that should expand rather than limit emission reduction opportunities. A competitive market similar to California's LCFS should be created to enable competitive efforts to decarbonize heat products and innovation in decarbonization. There are also several other low carbon fuel standard programs (See Figure 1) that generally depict the growing regulatory sentiment both domestically and internationally and can be referred to for program design and demand functions.

[3] Marshall, Liz, and Alexia Kelly. *The Time Value of Carbon and Carbon Storage: Clarifying the Terms and Policy Implications of the Debate*. World Resources Institute, Oct. 2010, https://files.wri.org/d8/s3fspublic/time_value_of_carbon_and_carbon_storage.pdf.



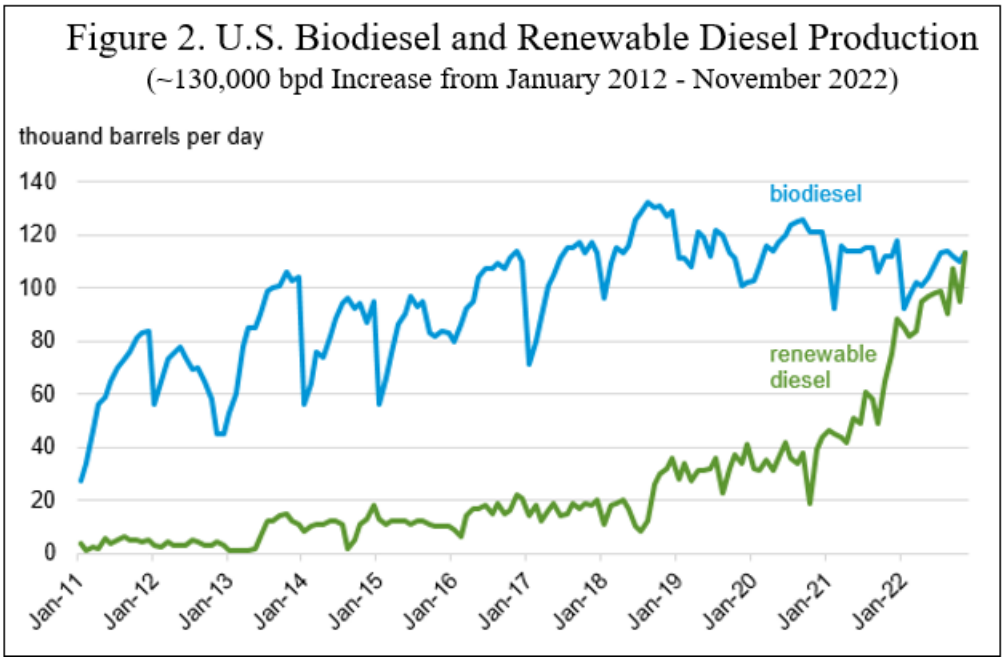
Additionally, the ability to bank credits for early action and overcompliance is important to maximizing emissions reductions now. An incentive for early overcompliance in the initial compliance years, such as a multiplier, could be a useful tool. Early emissions reductions are more impactful when accomplished sooner rather than later due to the Time Value of Carbon.[4] Thus, utilizing existing infrastructure, such as tanks and pipelines, is an essential tool in GHG emissions reduction policies. Massachusetts should engage with those who manage the existing liquid fuel infrastructure to craft policies and incentives so the State can efficiently reach its emission reduction targets, which cannot be met through mandated electrification alone. Finally, credit market transparency is critical to a successful CHS program to ensure that Massachusetts residents are protected from high costs. Ensuring that market prices for compliance options remain transparent will make sure that Massachusetts residents are not being charged unnecessarily high rates.

From a science-based, technology-neutral perspective, Global has concerns when specific feedstocks are subjected to artificial and arbitrary limits, such as a proposed cap on certain crop-based biofuels. Massachusetts must ensure that there is a feedstock neutrality focus on the program that uses renewable diesel, biodiesel, and other renewable fuels. Excluding certain feedstocks could prevent the maximization of early emissions reductions and also be a missed opportunity for Massachusetts to incentivize beneficial changes to agricultural practices outside the Commonwealth that reduce the carbon intensity of agricultural oils utilized in renewable fuel production. For example, Global believes that rulemaking should avoid pigeonholing soybean-based diesel usage and labeling it as simply a diversion from the transportation sector. This fuel type is necessary to meet several climate goals, and the state should not miss out on a market that is about to undergo a renewable diesel transformation just as dramatic as the corn market's ethanol boom in the mid-2000s.[5] Besides their lower carbon footprint, renewable diesel and biodiesel have numerous benefits to the communities they are used in, including the production of much

[4] Ibid.
[5] Kub, Elaine, *Looming Renewable Diesel Revolution Set to Change Rail Traffic.* The Progressive Farmer. April 19, 2023. https://www.dtnpf.com/agriculture/web/ag/news/article/2023/04/19/looming-renewable-diesel-revolution

cleaner exhaust and lowering tailpipe emissions such as particulate matter, carbon monoxide, total hydrocarbons, and nitrogen oxide.[6]

As clean fuel policies have grown in ambition and spread across the region, markets have responded to the policies, with biomass-based diesel production growing approximately 130,000 bpd in the last decade (See Figure 2).[7]



As demand has increased, the market has likewise responded. Renewable diesel plants are sprouting up across the United States. The conversion of existing oil refineries to renewable diesel plants, alone, is adding a considerable number of incremental volumes of renewable fuel for states to access. Since the start of 2020, some eight refineries have announced conversions to produce renewable fuels, and by 2025, these facilities could displace an incremental 238,000 bpd of renewable diesel.[8]

Utilizing the same carbon accounting framework as the majority of the country, the Department of Energy's GREET model,[9] [10] is critical to ensuring consistent measurement of carbon. There is no need to differentiate the Commonwealth of Massachusetts from others in the nation. Moreover, there has already been a host of debate surrounding New York's proposal to overhaul its emissions accounting

---

[6] State of Oregon Department of Environmental Quality. *Renewable Diesel 101*. https://www.oregon.gov/deq/FilterDocs/cfpdieselfaq.pdf

[7] U.S. Energy Information Administration. *Petroleum Supply Monthly* for renewable diesel date beginning in January 2020 and all biodiesel date; Monthly Energy Review for renewable diesel data prior to January 2020, https://www.bicmagazine.com/industry/refining-petrochem/us-renewable-diesel-production-surpassed-biodiesel-production/

[8] Koster, Frans. *Refinery Conversions to Double US Biofuels Output*. Energy Intelligence. September 21, 2022, https://www.energyintel.com/00000183-5c35-d675-afef-7db551080000

[9] Office of Energy Efficiency and Renewable Energy. *GREET: The Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation Model*. May 16, 2019, https://www.energy.gov/eere/bioenergy/articles/greet-greenhouse-gases-regulated-emissions-and-energy-use-transportation

[10] Although California uses the CA_GREET model, the version is predominantly the same and is only additionally configured for small pathways like compressed natural gas from dairy digester gas, liquified natural gas from landfill gas, and waste cooking oil and tallow pathways. *CA-Greet Life Cycle Model*. Life Cycle Associates, August 31, 2020, https://www.lifecycleassociates.com/lca-tools/ca_greet/

methodology due to cost concerns, highlighting another reason to avoid nonconformity in the rulemaking. Global believes that there should be a special emphasis on pursuing the State's objectives in a manner that does not disproportionally or adversely place costs on those least able to afford them, such as minority and low- and moderate-income individuals. To best mitigate emissions, the program must be designed to account for carbon across all sectors, including electricity. Failing to do so will inadequately address emissions releases in the state, as natural gas is the most common electricity generation source in the State, fueling almost two-thirds of our electricity production.[11]

In summary, the aforementioned environmental policy principles will result in better environmental outcomes for all of Massachusetts, which is a shared goal for all: industry, government, and Massachusetts residents.

Thank you again for considering our views and experience. If you have any questions, please do not hesitate to contact me directly at ckerns@globalp.com.

Sincerely,

Catie Kerns
Sr. Vice President, Corporate Affairs & Sustainability
Global Partners LP

[11] *Massachusetts Electricity Generation Sources*. ElectricRate.com. May 10, 2022, https://www.electricrate.com/massachusetts-electricity-generation-sources/#:~:text=Natural%20gas%20is%20the%20most,thirds%20of%20its%20electricity%20production

Green Harbor energy

Pioneering the Clean Energy Markets

Thomas J. Flynn
Senior Vice President
Green Harbor Energy
125 Church Street, Suite 90-154
Pembroke MA 02359
Email: tflynn@greenharborenergy.com

May 1, 2023

Delivery by Email

Subject: MassDEP Stakeholder Response Regarding the Clean Heat Standard Program Design

Green Harbor Energy has been instrumental in the formulation, development and success of the Massachusetts APS program since its inception in 2008. In fact, the team at Green Harbor qualified the very first project in the program, a CHP project at Acushnet, known for its distinguished brand of golf balls, Titleist.

Currently, renewable thermal projects in Massachusetts may participate in the MA APS program and receive Alternative Energy Credits (AECs) as an incentive to install or convert existing systems. Given the existing financial incentive for renewable thermal projects through the MA APS program, it would be most beneficial to the implementation of the Clean Heat Standard (CHS) to be developed in conjunction with the existing APS program from both a speed of adoption and integration of programs perspective.

The key elements in having the CHS program work in concert with the APS program is that there is a structure and a market already in place. CHS would be able to utilize the 15 years of accumulated experience of qualifying projects, verifying data, bringing "incentive" credits to an established market, where regulated utilities and third-party suppliers can fulfill their obligations. Combining the CHS program with APS program will also serve to strengthen the APS credit, which is currently supporting the small renewable thermal market that includes homeowners and low-income housing.

There is no need to eliminate the APS program for the purpose of eliminating CHP. CHP is well into the process of sunsetting organically as evidenced by falling annual production year-over-year. The normal life expectancy of a CHP project is roughly 12 years. The biggest years for CHP implementation in Massachusetts were over a decade ago covering the time period 2008-2011. There hasn't been a new CHP system qualified in Massachusetts since March of 2020, which was the only system qualified that year. The MA APS program is naturally transitioning from primarily supporting CHP development to a key financial incentive for renewable thermal development.

While the MA APS has helped significantly in the growth of small renewable thermal projects, intermediate and large renewable thermal systems have not had the same success. In fact, only one system in the medium/large category has been qualified thus far by the Department of Energy Resources (DOER). This is an area of opportunity for the CHS to make a great impact in achieving the Commonwealth's goals.

Best regards,

Thomas J. Flynn
Senior Vice President

April 29, 2023

Bonnie Heiple, Commissioner
Massachusetts Department of Environmental Protection
100 Cambridge Street, Suite 900
Boston, MA 02114

For electronic submission only via climate.strategies@mass.gov

Re: Massachusetts Clean Heat Standard Stakeholder Input

Dear Commissioner Heiple,

We appreciate the efforts made by Massachusetts Department of Environmental Protection (MassDEP) to seek stakeholder input in the development of the Clean Heat Standard. We support the development of a Clean Heat Standard and offer comments on the stakeholder process and the following questions:

> ***3) What counts as clean energy that can be awarded compliance credits?***
>
> ***Which clean heat technologies should be eligible for crediting under the CHS? When and how should new options, such as hydrogen and advanced biofuels, be evaluated?***

We represent the Hydrogen/Biogas Working Group of the Gas Transition Allies (GTA, formerly Gas Leaks Allies). Gas Transition Allies is a coalition of more than 25 organizations and experts, which works to reduce methane emissions and advance a rapid transition from gas to non-combusting renewable energy.

The clean heat standard (CHS) should only include combustion-free energy like energy efficiency, heat pumps, and networked ground source heat pumps; it should exclude polluting combustion fuels, like hydrogen and biofuels. Hydrogen and biofuels are polluting, dangerous, inefficient, and do not significantly reduce greenhouse gas emissions. Including hydrogen and biofuels in the clean heat standard would be out of step with the Massachusetts Clean Energy and Climate Plan (CECP) for 2050, which seeks to “ameliorate existing air pollution conditions while reducing greenhouse gas (GHG) emissions across the Commonwealth” and the Clean Heat Commission’s report,

which states that the “Commonwealth should ensure that the health benefits from reducing exposure to air pollutants are factored into decision-making and incorporated into cost-benefit calculations across all major decarbonization programs.”

Biofuels and green hydrogen made using renewable energy have an important role in the future, but should be reserved for hard-to-electrify industrial processes. They should be produced preferably onsite, or if not, then as close to the end use as possible to minimize leakage and pollution.

Hydrogen and Biofuel Pollution Maintain Health Inequities

Natural gas and renewable natural gas made from biofuels are composed predominantly of methane. The byproducts of burning methane are nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter smaller than 2.5 microns ($PM_{2.5}$) and volatile organic compounds (VOCs). These byproducts are vented directly outdoors into neighborhoods when burned for space and water heating, contributing to significant amounts of ambient air pollution.[1] They can also contribute to indoor air pollution through unvented gas cooking and when heating appliances are not properly installed. Nitrogen dioxide and other nitrogen oxides in ambient air contribute to particle formation and to the chemical reactions that make ground-level ozone. In Massachusetts, buildings powered by fossil fuels contribute more ambient nitrogen oxides (a precursor to smog) and fine particulate pollution than electricity generation.[2] While burning hydrogen in end-use appliances may not release carbon dioxide, it does still produce air pollution in the form of nitrogen oxides (NO_x).[3, 4] Expanding hydrogen into homes and businesses is not clean and will at the very least maintain current pollution rates, not reduce them.

The health effects of air pollution are consequential. Ambient air pollution is associated with increased rates of asthma, chronic obstructive pulmonary disease **(**COPD), and

[1] Dedoussi et al., Nature Feb 2020 (MIT study- supplemental material).
[2] US Environmental Protection Agency (EPA).National Emissions Inventory. 2014. https://edap.epa.gov/public/extensions/nei_report_2014/dashboard.html#trend-db
[3] Cellek, Mehmet Salih, and Ali Pınarbaşı. “Investigations on Performance and Emission Characteristics of an Industrial Low Swirl Burner While Burning Natural Gas, Methane, Hydrogen-Enriched Natural Gas and Hydrogen as Fuels.” International Journal of Hydrogen Energy 43, no. 2. January 11, 2018: 1194–1207. https://doi.org/10.1016/j.ijhydene.2017.05.107.
[4] Lewis, A. Optimizing air quality co-benefits in a hydrogen economy: a case for hydrogen-specific standards for NOx emissions. Environ. Sci.: Atmos., 2021,1, 201-207 https://pubs.rsc.org/en/content/articlelanding/2021/ea/d1ea00037c

cardiovascular disease.[5] [6] Air pollution from burning fossil fuels contributes to 7600 premature deaths in Massachusetts a year.[7]

Blending hydrogen or biofuels with fossil fuels to deliver heat will maintain reliance on those pollution producing fuels, such as methane gas, and perpetuate already-existing health inequities associated with combustion fuels. Black, Indigenous and People of Color (BIPOC) are exposed to more nitrogen oxides[8] and particulate matter from burning fossil fuels than white people,[9] and consequently have higher rates of pollution-related illnesses like asthma. Polluting infrastructure is more often installed in environmental justice communities. Operation, maintenance and leakage from this infrastructure will remain an ongoing problem disproportionately affecting the health of people living in environmental justice communities.

Safety

The Commonwealth should not fund fuels like hydrogen that pose significant safety risks, when safer appliances like heat pumps are available. Hydrogen ignites more easily and has a wider explosive range than natural gas.[10] Faster flame speed and increased water content from burning blended hydrogen could reduce the life of appliances and increase the risk of flashback.[11] Flashbacks can lead to appliance shut down, damage to the appliance and may cause injury from gas buildup. Researchers in the United Kingdom found the risk of injuries from explosions increases as much as 400

[5] Guarnieri M, Balmes JR. Outdoor air pollution and asthma. Lancet. 2014;383(9928):1581-92. https://www.sciencedirect.com/science/article/abs/pii/S0140673614606176
[6] US Environmental Protection Agency. Outdoor Air Quality: What are the trends in outdoor air quality and their effects on human health and the environment?. https://www.epa.gov/report-environment/outdoor-air-quality#exposure Accessed 10/9/19.
[7] https://www.bostonglobe.com/2021/02/09/metro/burning-fossil-fuels-kills-an-estimated-350000-people-year-study-finds
[8] US Environmental Protection Agency. Integrated Science Assessment (ISA) for Oxides of Nitrogen – Health Criteria (Final Report, Jan 2016). 2016. https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=310879. Accessed 4/16/23
[9] Tessum, C. W., Paolella, D. A., Chambliss, S. E., Apte, J. S., Hill, J. D., & Marshall, J. D. (2021). PM2.5 polluters disproportionately and systemically affect people of color in the United States. Science Advances, 7(18), eabf4491. https://www.science.org/doi/10.1126/sciadv.abf4491
[10] National Renewable Energy Laboratory (NREL). Blending Hydrogen into Natural Gas Pipeline Networks: A Review of Key Issues. March 2013. https://www.nrel.gov/docs/fy13osti/51995.pdf Accessed 11/8/2021.
[11] Harmen de Vries, Anatoli V. Mokhov, Howard B. Levinsky, The impact of natural gas/hydrogen mixtures on the performance of end-use equipment: Interchangeability analysis for domestic appliances, Applied Energy, Volume 208, 2017, Pages 1007-1019, ISSN 0306-2619, https://doi.org/10.1016/j.apenergy.2017.09.049.

percent with just a 20 percent blend of hydrogen without hydrogen flow monitoring devices.[12]

It would require an unprecedented effort to assure the safety of hydrogen in Massachusetts households with little climate benefit. NaturalHy, a European Commission-supported project, warns that "poorly adjusted appliances" should not be used with blended hydrogen.[13] This is a vague definition, but it's unclear how many appliances used by residents of the Commonwealth might fall into this category. The California Public Utilities Commission was more specific and stated, "Hydrogen blends above 5 percent could require modifications of appliances such as stoves and water heaters to avoid leaks and equipment malfunction." The number of households that would require these updates is extensive: about 45 percent of households in Massachusetts cook with gas stoves and over 50 percent heat with water heaters,[14] and the expected GHG reduction from a five percent hydrogen blend would be at most one percent.

Combustion fuels increase leaks and greenhouse gas emissions

Massachusetts has some of the oldest, leakiest gas pipes in the country[15] and blending hydrogen will increase leaks. Methane leaks along the entire gas infrastructure system, from the wellheads to distribution pipes to inside our residential and commercial buildings.[16] Hydrogen will further contribute to this leakage problem. It can embrittle steel pipes, and hydrogen has higher permeation rates for elastomeric seals and plastic pipes. The National Renewable Energy Laboratory (NREL) warns "The accumulation of leaked gas over time may present a safety concern in a confined space where there are many sealed joints causing additional leaks."[17] The California PUC studied hydrogen blending and confirmed NREL's assessment; they found blending more than five percent hydrogen into existing natural gas pipelines leads to the embrittlement of steel pipelines, which raises the chance of leaks. Hydrogen blends greater than 20 percent "present a higher likelihood of permeating plastic pipes, which can increase the risk of

[12] ARUP. Hy4Heat Safety Assessment Conclusions Report: Incorporating Quantitative Risk Assessment May 1, 2021. https://static1.squarespace.com/static/5b8eae345cfd799896a803f4/t/60e399b094b0d322fb0dadc4/1625528759977/conclusions+inc+QRA.pdf

[13] Florisson, O. Preparing for the Hydrogen Economy by Using the Existing Natural Gas System as a Catalyst. NaturalHy project Report SES6/CT/2004/502661. 2010. https://www.fwg-gross-bieberau.de/fileadmin/user_upload/Erneuerbare_Energie/Naturalhy_Brochure.pdf

[14] https://www.eia.gov/consumption/residential/data/2020/state/pdf/State%20Water%20Heating.pdf

[15] https://www.gastransitionallies.org/safety

[16] https://www.pnas.org/doi/10.1073/pnas.2105804118

[17] National Renewable Energy Laboratory (NREL). Blending Hydrogen into Natural Gas Pipeline Networks: A Review of Key Issues. March 2013. https://www.nrel.gov/docs/fy13osti/51995.pdf Accessed 11/8/2021.

gas ignition outside the pipeline."[18] These additional leaks introduced as a result of hydrogen blending will only worsen Massachusetts' existing gas leakage problem. The Commonwealth has invested in reducing its leaks through the Gas System Enhancement Program (GSEP), at an estimated total cost of $40 billion,[19] but has thus far been unsuccessful; after six years of GSEP[20] there has not been a significant reduction in the over 20,000 leaks statewide.[21]

Like fossil gas, hydrogen and renewable natural gas (made from biofuels) will leak from the leaky distribution system, contributing to greenhouse gas emissions. Renewable natural gas can be developed from biofuels, with the resulting gas being predominantly methane, a potent greenhouse gas that when leaked has a 20-year global warming potential of 84-87[22] but this captured biogas is better used to generate electricity for onsite or grid use. Hydrogen is an indirect greenhouse gas with a 20-year global warming potential of 33.[23] It's high propensity to leak may limit hydrogen's effectiveness for reducing emissions,[24] especially if introduced into the leaky distribution system in Massachusetts.

Combustion fuels increase greenhouse gas emissions

While combusting hydrogen does not emit carbon dioxide, the production of hydrogen can significantly increase greenhouse gas emissions. The U.S. has defined "clean hydrogen" as both green hydrogen (made from renewable energy) and blue hydrogen (made from methane, with carbon dioxide captured and stored), but blue hydrogen is far from clean. Emissions from blue hydrogen come from three main sources: methane

---

[18] https://www.utilitydive.com/news/hydrogen-blends-higher-than-5-percent-raise-leak-embrittlement-risks/627895

[19] The $40 billion estimate for GSEP's capital revenue requirement, expressed in constant 2019 dollars, is based on a straight-line depreciation model assuming current DPU-approved rates of return on pipeline assets and the 60-year asset life for polyethylene pipes claimed in CY2022 GSEP proceedings. See Dorie, Seavey, , "*Spending billions fixing gas system makes no sense - Lawmakers shouldn't allow utilities to retool to carry new fuels,*" Commonwealth Magazine, April 22, 2022, https://commonwealthmagazine.org/opinion/spending-billions-fixing-gas-system-makes-no-sense/

[20] https://static1.squarespace.com/static/612638ab5e31f66d7ae8f810/t/61561b8c4955b93159a753a3/1633033102069/GSEPatTheSix-YearMark.pdf

[21] https://heet.org/gas-leaks/gas-leak-maps/

[22] U.S. EPA. Understanding Global Warming Potentials. Last updated on October 18, 2021. https://www.epa.gov/ghgemissions/understanding-global-warming-potentials#Learn%20why

[23] Warwick, N., Griffiths, P., Keeble, J., Archibald, A., Pyle, J., and Shine, K., Atmospheric implications of increased Hydrogen use. Department of Business, Energy and Industrial Strategy, United Kingdom April 2022. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1067144/atmosphericimplications-of-increased-hydrogen-use.pdf Accessed 6/1/2

[24] https://acp.copernicus.org/articles/22/9349/2022/acp-22-9349-2022.pdf

leaks along the natural gas system from extraction to end use, the additional energy needed to capture carbon, and the carbon dioxide that cannot be captured. A peer reviewed study found that blue hydrogen used for heating can emit more greenhouse gases than simply using the fossil fuels directly for heat.[25]

Green hydrogen for heating is too inefficient to be useful in blending with methane for heating. The potential to blend hydrogen with methane is limited to 5-20 percent because beyond a small blend, it would require updated or new end-use appliances. Hydrogen has a lower heat density by volume so a 20 percent blend by volume would only provide about seven percent of the energy, and thus only reduce greenhouse gas emissions by about 6-7 percent. Once additional leaks from pipes and polymers are taken into account, the decarbonization gains from blending green hydrogen would be insignificant, especially in comparison to heat pumps.

Using green hydrogen to blend with methane for heating will make small-to-no reductions in emissions from natural gas, but it will maintain dependence on polluting methane gas and its entire infrastructure. With hydrogen blending, at least 80 percent of the gas system would remain methane, most of it developed by fracking, leading to continued harms to health, greenhouse gas emissions, and health-harming global warming.

Truly green hydrogen requires a dedicated source of carbon-free clean electricity for production. Including green hydrogen in the CHS will set up the potential for green hydrogen production to hijack clean energy from the electric grid required to power heat pumps. Diverting the green electricity risks leaving no renewable energy for other sectors, like transportation, which are also depending on clean electricity to decarbonize. A study in Massachusetts found that using hydrogen for heating would require more than three times more renewable energy to produce hydrogen for combustion for building heat than powering heat pumps directly, and use more wind than we have planned for 2030 just to replace 20 percent of natural gas.[26] Hence the pace of decarbonization of the electricity needed to power existing and new electric appliances, devices, and systems would be severely impaired. The emissions attributable to activities and processes dependent on electricity would be reduced by smaller amounts, offsetting and perhaps wiping out the overall emissions picture the already minor reductions in building emissions attributable to the blending of methane with green hydrogen.

---

[25] Howarth, RW, Jacobson, MZ. How green is blue hydrogen? Energy Sci Eng. 2021; 00: 1– 12. https://onlinelibrary.wiley.com/doi/full/10.1002/ese3.956

[26] Roetter & Richardson, Impact of Green Hydrogen Production on the Availability of Clean Electricity for the Grid, available at https://www.gastransitionallies.org/hydrogen-report

Stakeholder Process

We recommend the stakeholder process include the following:

1. A series of topic-based technical sessions, fully open to the stakeholder communities including but not limited to low income, environmental justice, climate, health, natural resources advocates, must be held during development of the CHS.

2. The CHS development process should be transparent:
    - Make recorded presentations, oral and written testimony, minutes of meeting with stakeholders, and/or representatives of the utilities available to public;
    - The decision-making process should be public and allow for public input, including priorities, principles, and data sources.

3. Decisions should be made using the best-available, science-based evidence, prioritizing peer-reviewed and independent sources of information.

4. Public health and environmental justice should be stated priorities for the CHS:
    - The cost of health impacts from of air pollution and greenhouse gases should be incorporated into all cost estimates;
    - Infrastructure supported by the CHS should improve living conditions in environmental justice communities, not make them worse.

Conclusions

The Clean Heat Commission recommended that health impacts of air quality are factored into decision-making and accounted for in cost-benefit calculations. When health, safety and emission are considered, hydrogen and biofuels have no place in the CHS. Healthier and safer options are already available. We urge you to exclude fuel combustion from the CHS.

Sincerely,

Andee Krasner, MPH
Program Manager, Climate and Health,
Greater Boston Physicians for Social Responsibility
On behalf of the Hydrogen/Biogas Working Group of Gas Transition Allies

May 9, 2023

Massachusetts Department of Environmental Protection
100 Cambridge St, Suite 900
Boston, MA 02114
United States

Email: climate.strategies@mass.gov

RE: Irving Oil Limited ("Irving Oil") Response – MassDEP Stakeholder Discussion Document: Clean Heat Standard Program Design

Dear Mass DEP,

About Irving Oil

Irving Oil has been active in the United States (US) energy market since 1972, providing a suite of energy products including gasoline, diesel, home heating oil, propane, asphalt, and marine and aviation fuels. We are proud of our history of serving the Northeastern US, and we are confident in our ability to continue to supply quality products to meet the region's current and future energy needs. Our Saint John, New Brunswick refinery produces over 300,000 barrels of petroleum products per day, of which over 80% is bound for the United States market. Named one of Canada's Top 100 Employers for seven consecutive years, we employ over 650 employees in New England. We are proud of our team and our longstanding commitment to our customers and our communities.

Irving Oil's largest (by volume) marine terminal within its New England network is located in Revere, Massachusetts (MA). Irving Oil's Revere Terminal receives and distributes gasoline (typically blended with ethanol) and distillate fuels, such as heating oil and diesel. This terminal supports

Irving Oil's retail businesses and serves hundreds of additional wholesale customers, who in turn retail throughout Massachusetts.

Energy Transition at Irving Oil

We are on a continuous journey of sustainable development, working to reduce our environmental footprint while continuing to provide safe, compliant, and reliable energy to our customers. As part of our Energy Transition and Climate Strategy, we have set a 30% greenhouse gas (GHG) emission reduction goal by 2030, with an aspiration to achieve net-zero by 2050. We have an Energy Transition Strategy in place to achieve our 2030 climate goal – and progress is already being made toward reaching this target.

As part of our sustainability strategy, we are exploring and investing in various decarbonization projects (including low carbon electrification, cogeneration, renewable electricity solutions, hydrogen production, renewable gas, biofuels, Carbon Capture Utilization and Sequestration, and investments in Electric Vehicle (EV) charging infrastructure). The targets outlined in our most recent Report on Sustainability [1] have been carefully considered as part of our overall decarbonization efforts.

Introduction

We appreciate the opportunity to provide our comments to the MassDEP on the proposed Clean Heat Standard (CHS) Discussion Document and the Discussion Draft Regulation, as the proposed CHS would have significant impacts to industry, businesses, and consumers. As evidenced by the concrete steps we have taken further to our own Energy Transition and Climate Strategy, we are ready to help Massachusetts achieve its similar goals.

All the northeastern states, including Massachusetts, require the use of Ultra Low Sulphur Diesel (ULSD)—which has sulfur levels no greater than 15 parts per million—for heating purposes. For comparison, fewer than one in five Massachusetts households use electricity as their primary energy source for home heating.

The CHS is a challenging and highly complex policy with considerable potential for unintended and significant impacts – primarily related to energy cost and supply security — to New England consumers. Accordingly, our view is that the timing of the CHS should be staged and paced to mitigate the risk of such impacts to consumers. We feel that it is critical that MassDEP ensure

[1] https://www.irvingoil.com/en-CA/irving-values/sustainability-report-esg

that there are enough market participants within the proposed CHS to provide feasible credit generation pathways to meet the program targets and to ensure the success of the program.

The currently proposed CHS would result in significant costs affecting our business, retailers, and end consumers. For example, if the credit price was $300/ credit (based on the EIA CO_2 emission factor for heating oil and the range of credit prices included in the February 7th, 2023, Policy and Regulatory Analysis by Synapse Energy Economics, Inc.[2]), at a 4% reduction target, the CHS would result in compliance costs of over $12 million per year. Based on Irving Oil's current volumes in Massachusetts, the current CHS would result in a compliance cost of $20 million for the heating oil market. This would result in a per gallon consumer impact of 12 cents per gallon at a credit price of $300/ton up to 20 cents per gallon at a credit price of $500/ton. The proposed CHS Discussion Document states that an average pace of approximately 100,000 residential heat pump installations per year from 2025-2050 would be adequate to meet the targets. We ask that MassDEP take into consideration the supply and availability of heat pumps and the consumer choice/ uptake of these technologies to determine if this timeline is feasible to achieve. We further ask MassDEP to consider biofuel supply and availability as an alternative to heating oil to meet the annual reduction targets.

We recommend that MassDEP conduct a cost benefit analysis in an effort to fully understand the economic impact of this policy on energy security/supply, industry, businesses, and consumers (including cents per gallon impact) as well as any unintended consequences. We feel that more time is needed for the development of the regulatory design of the CHS before the final rulemaking to ensure there is a reasonable means to meet compliance. For this program to succeed, it must include annual carbon intensity compliance targets, rather than only including percentage reduction goals, in order for obligated parties to have a transparent means of determining their obligation.

Our team has considerable experience working with regulators on several US and Canadian regulations including the Clean Fuel Regulations (CFR), Quebec Integration of low-carbon-intensity fuel Regulations, Cap and Trade (in Nova Scotia, Quebec), and the US Renewable Fuel Standard (RFS), which have similar objectives to portions of the CHS. To this end, we are pleased to share our practical experiences and lessons learned operating under these regulations for consideration. There are many aspects from these regulations that can be considered in the regulatory design of the CHS.

Our key recommendations are focused on the following topics:

- Timing and Implementation;

[2] Massachusetts-Clean-Heat-Standard-–-Policy-and-Regulatory-Analysis.pdf (clf.org)

- Regional Implications and Security of Supply;
- Cost to Industry and Consumers;
- Impacts to Competitiveness;
- Target and Trajectory;
- Compliance Pathways;
- Compliance Mechanisms

A summary of key issues in each of these areas is provided below with further technical considerations in an attached Appendix.

Timing and Implementation

The current regulatory timeline for the CHS contemplates the release draft regulations this spring and final rulemaking this year; we feel that this timeline is too compressed and ultimately impractical. The proposed CHS is a low carbon fuel policy, which places it amongst the most complex environmental policies in the world as it impacts and interacts with so many different sectors and regions. For example, in Canada it took nine years for the finalization of the CFR (from start of development), with a similar timeframe for the Quebec Low Carbon Fuel Integration Regulations.

Publishing draft regulations in 2023 does not allow enough time for meaningful consultation given the broad scope and far-reaching impacts across our business. The proposed implementation year of 2025 does not provide adequate time for obligated parties to plan for compliance and make the necessary capital investments that are needed (i.e., biofuel blending infrastructure). The timing for implementation does not align with our company capital funding and business planning, which is done on a 5-year cycle.

Further modelling is required to determine the baseline fossil fuel carbon intensity (CI) values, annual CI reduction targets, and feasible compliance pathways required to achieve the targets prior to issuing the final rulemaking, along with ample time for multi-stakeholder consultation.

Regional Implications and Security of Supply

Due to variations in demographics, population, and infrastructure, we recommend that an economic impact analysis be conducted to determine the cost impacts on industry, businesses, and the end consumers. Irving Oil supports the approach of understanding and learning employed prior to the implementation of programs in other jurisdictions (e.g., California, British Columbia, Canada, Quebec and the European Union). The implementation of a CHS simply using methodologies developed for other regions of North America may not be appropriate for

Massachusetts, and could result in unintended consequences for rural areas or low-income households.

We note that energy providers currently face supply challenges resulting from the ongoing conflict in Ukraine and new climate/energy policies. It is anticipated that energy supply challenges with potential to impact regional energy security will remain and possibly intensify in the foreseeable future. As such, it is important to ensure that the final Regulation can adapt to such disruptive market forces facing the energy markets.

It should not be taken for granted the reliable, warm heat, service, and stored energy that is provided by heating oil, natural gas and propane. End-use consumers may decide to install heat pumps for energy efficiency improvements and for air conditioning. However, in many homes, heating oil is still needed for the cold New England temperatures and hot water heating. It's not a one-for-one substitute to remove an oil furnace with forced air and replace it with a mini split heat pump unit. Many homeowners who install heat pumps, also install generators for a back-up power supply which can very expensive.

Due to these ongoing issues and the complexity of this policy, as well as the other regulatory design elements that still need to be developed, we recommend that the MassDEP pause on the development of these regulations and focus on undertaking a robust consultation process (including economic impact modelling) to more completely understand the potential impacts and consequences of the proposed CHS.

Cost to Industry and Consumers

Based on the material presented to date, there is limited information available with respect to the financial impacts to both industry and the consumer for the implementation of a CHS. Based on our experience with existing low carbon fuel regulations, the compliance, abatement, and overall program costs can be considerable. For example, the price of renewable diesel, also known as hydrogenation-derived renewable diesel (HDRD) is double the price of heating oil, as it is in such high demand to meet other low carbon fuel standard markets such as California. MassDEP must understand that all renewable fuel products are commodities, the prices of which are based on both national and international markets. For example, a gallon of renewable diesel sold in Massachusetts will reflect the price that same gallon would sell for in a higher credit market (like California). We thus recommend that detailed economic modelling be conducted by region to determine the cost benefit analysis of the program.

To accelerate the uptake of alternative technologies and make the energy transition functional for all participants, we feel that regulators should focus efforts on energy incentive programs,

such as funding and grants for investing in/ producing clean energy and low carbon fuels. We are mindful of the impacts that increased prices on heating oil will have on low-income households/communities. Rather than picking technological winners and losers, the government should allow for consumer choice that provides incentives for low carbon alternative technologies, and in doing avoid significant cost impacts to consumers.

It should be noted that heating oil is not an obligated product under several renewable fuel regulations (such as the US RFS and the Canadian CFR) due to the cost impacts on low income and rural communities. The potential cumulative cost impacts of the proposed CHS to households would be significant, whether based on the increased fuel prices or for the upgrades to electrify homes. There should also be consideration that not every house will be easily converted from a heating oil furnace/ boiler system to an Air Source Heat Pump (ASHP). There also may be customers that are not able to upfront the initial capital investment to convert to a heat pump.

Impacts to Competitiveness

Irving Oil has operations in Maine, Vermont, New Hampshire, Rhode Island, Connecticut, and Massachusetts. The impacts of state-level climate policies to energy security and supply, as well as impacts on trade flows between neighboring states has major implications to our business.

The proposed CHS will result in increased compliance and operating costs for all market participants, which costs would need to be recovered in the market. These costs could have a direct impact on Massachusetts energy market participants' ability to compete on a statewide and regional scale, as neighboring states do not have the same policies and regulations. There needs to be a level playing field in order to not impact competitiveness or energy security.

Target and Trajectory

Policies should be based on sound science and economics. We feel that the regulations need to include default/ baseline CIs (which need to be modelled to set the baseline) as well as the annual CI reduction targets to allow obligated parties to properly construct business plans/ compliance plans.

Compliance pathway modelling to determine the targets and trajectory is critical and must be given considerable time to get right so that obligated parties will have a reasonable opportunity to comply at the lowest cost possible. Prior to finalizing the baseline CIs and annual reduction targets, it is recommended that MassDEP consult with all stakeholders (obligated parties, credit creators, greenhouse gas (GHG) auditors, CI life cycle modelling experts, etc.) for setting the appropriate baseline CIs and annual reduction targets.

Compliance Pathways

There should be no limitations on biofuels for credit creation as these are currently being supplied and will be a primary means of meeting compliance. Biofuels provide near term emission reduction opportunities as well as significant future decarbonization opportunities as technologies advance and new low CI fuel pathways are developed. Renewable fuels eligible to generate credits should include biodiesel, renewable diesel, Renewable Natural Gas (RNG), hydrogen, renewable propane, biogas, as well as any other low carbon fuel alternatives. Renewable diesel and RNG are drop in fuels that could be readily added to the existing infrastructure is already inplace.

End-use fuel switching should be eligible as a means to comply because a *lower* carbon fuel (i.e., heating oil to natural gas) is still an improvement in emission reductions and shouldn't be discredited. Energy efficient heating systems, including but not limited to Combined Heat Power (CHP) systems that may use portions of fossil fuels should also be incentivized.

The proposed CHS design is not technology neutral because it is "choosing the solution technology" and not allowing the efficiency of products and/or the market to determine which products will meet the requirements most cost effectively. Converting 80% of homes to use ASHPs is choosing a solution which restricts credit opportunities for low carbon fuels that would result in substantial emissions reduction. The policy should allow for consumers to choose the best solution and avoid picking winners and losers, so it is not forcing certain technologies. Allowing all of these options will drive cost-effective maximum decarbonization reductions to ensure Massachusetts can achieve its climate goals.

It is also recommended that MassDEP consider including credit generation for CO2 emission reduction projects across the fossil fuel life cycle. In the California and BC Low Carbon Fuel Standards and the Canadian Clean Fuel Regulations, credit generation includes upstream and downstream (refinery projects), as well as emission reduction projects at terminals including fuel switching and energy efficiency projects. By providing multiple credit generation opportunities, credit market liquidity will be enhanced and a level playing field will be established among other LCFS programs that allow for credit generation from upstream and downstream operations.

Alternative Compliance Options

Irving Oil recommends that MassDEP include multiple flexible compliance mechanisms in the regulatory design of the CHS. This would include establishing a credit trading system, a compliance credit clearance mechanism, an emission reduction fund, and a buy-out option by making a payment to the government (Alternate Compliance Payment), to ensure obligated parties can achieve compliance and to mitigate the risk of illiquidity in the market.

Creating a carbon market platform for the credit trading system is a complex, multi-year, undertaking. Environmental credits are financial instruments that are traded similar to other commodities. MassDEP must ensure that there is governance, oversight, and security to protect the integrity of the system from financial fraud. In similar programs with credit trading, third party audits are required and capacity for this process must be well understood and available. Given these considerations, we feel the timing for final rulemaking in 2023 and implementation by 2025 is unrealistic and not feasible.

Closing

Irving Oil appreciates MassDEP's commitment to engaging industry for input into the development of a transparent and effective Clean Heat Standard that is based on sound science and economics. Irving Oil will continue to be an active stakeholder in this process as Massachusetts moves forward with the development of the program. We are available to discuss this submission at your convenience and look forward to continued collaboration with MassDEP.

Sincerely,

Joe Harriman
Director, Environmental and Regulatory Strategy
Irving Oil

cc: Kevin Scott – Chief Refining and Supply Officer, Irving Oil
Sam Robinson – Director, Advocacy and Sustainability, Irving Oil
Liam O'Brien – Manager, Government Relations, Irving Oil
Heidi Clifford – Manager, Regulatory Affairs, Irving Oil

Appendix: Proposed CHS Technical items:

Item	Irving Oil Comments
Point of Obligation	We understand that the obligation will be on heating oil retailers and not who imports product into the State and that importers (i.e. terminals) will only be obligated for GHG emission reporting. It is recommended that the definition of point of obligation be clearly defined in the draft regulations.
CI Life Cycle Model	It is understood that the GREET model will be used to determine the life cycle carbon intensity values. This model is used in California. However, there are many different LCA models used currently in North America, including GHGenius and the Federal Open LCA model. It is very complicated for fuel suppliers to determine CIs of the same fuel using different models for different jurisdictions. MassDEP should work with the US Federal EPA and other states with low carbon fuel policies to harmonize and utilize the same model.
Low-Income Targets	It is not clear how a fuel supplier would meet the target of converting low-mid-income homeowners. A wholesaler would not know the income levels of its customers.
Low CI Electricity Availability and Carbon Intensity	MassDEP needs to consider if there is enough low carbon electricity generation and transmission if the state were to convert 80% of homes to heat pumps for the grid to be able to accommodate the increased demand. The CHS must consider the life cycle carbon intensity of the grid. MassDEP should also evaluate how much lower the grid carbon intensity is, compared to the fuel it is replacing.
Third Party Audits/ Verification	It is not clear if the CHS would require third party audits for reporting and CI calculations. Typically, an emission credit program must involve audits to mitigate the risk of fraud which would undermine the integrity of the credit program.
Transfer of Obligation/ Transfer of Right to Create Credits	It is recommended that MassDEP allow for the right to transfer the obligation between parties as well as the right to create credits. This can be done though a contractual agreement.
Registration and Reporting	It is recommended that MassDEP develop guidance and rules for registration and reporting. This would include compliance reporting on obligated fuels and credit creation reporting.
Tracking of Fuels	It is recommended that MassDEP develop guidance on how exported fossil fuels and low-CI fuels will be tracked that are exported or leave the State. In many similar programs, an attestation process is used for tracking fuels exported out of state (so they can be removed from the obligation). It should be noted that

	tracking exported products once custody transfer is completed would be very complicated as tracking of product movement, volumes, and ownership does not extend beyond the point of Custody Transfer
Credit Trading System	• To assist in compliance, early credit creation should be expanded and stacking of credits should be permitted between eligible activities/programs. • MassDEP should also indicate a credit floor price within the draft regulations to provide a signal to the credit market for trading. MassDEP must also develop trading rules including determining if holding limits, carry forward limits, banking limits, etc., are needed in order to prevent hoarding and market manipulation. • It is not clear if the trading system will be conducted via a live trading system or if trading will be conducted via peer to peer transfer. • It is recommended that MassDEP develop guidance documents on registration, reporting and credit trading. MassDEP must provide ample time for training and testing of the credit trading system as well as reporting and registration training for obligated parties and credit creators must be completed at a minimum of one year prior to implementation of the regulations.

LOMBARDI
ENERGY SERVICES
Delivering Comfort to Our Community

978.465.7200
LombardiEnergy.com
16 Perry Way • P.O. Box 1420
Newburyport, MA 01950

May 1, 2023 Massachusetts Department of Environmental Protection

100 Cambridge Street
Suite 900
Boston, MA 02114
RE: Clean Heat Standard

Today I write to you as a stakeholder regarding the proposed Massachusetts Clean Heat Standard. I am the Owner of Lombardi Energy headquartered in Newburyport MA, serving 7 communities and 3000 We have been in business for 65 years.

My company sells deliverable fuels (biofuel, kerosene) and provides HVAC and home comfort service to many Massachusetts communities that would be affected by the proposed MA Clean Heat Standard. I write this letter today with grave concerns about implementation of the MA Clean Heat Standard ("CHS"), not only for my business and its employees but for all Massachusetts residents and consumers of delivered fuels in the state as well.

The poorly written CHS rule-making calls into question the seriousness and professionalism of its architects and their grasp of basic Massachusetts Consumer Protection and Business law. It raises serious questions of their motivations regarding the lack due diligence to assess the economic and operating impacts of the CHS on MA small businesses and MA consumers this standard will surely affect.

- To require retail heating oil and propane dealers to convert 3% of their customer base annually to electric heat pumps is an anti-competitive practice and possibly in violation of a number of constitutionally protected rights of business to operate within the state.
- To require forced conversion from one fuel source to another or rules that favor one heating system over another infringes upon Massachusetts' Consumer Protection Act and rights.
- In addition to completely ignoring many consumer protection laws, we believe many of the measures as written in the CHS oversteps MA DEP's legal operating purview and therefore would expect the state to be on the receiving end of a number of lawsuits for the CHS as written.

Simply put, the Massachusetts Clean Heat Standard has many obvious flaws, is not well researched and lacks the basic understanding of business and consumer protection laws in the state of Massachusetts. The CHS regulations, as written, place undue economic and regulatory burden on Massachusetts residents, consumers and small businesses within the state. It's contribution to achieving the climate goals of the state is extremely unclear and unquantified. It's lack of a study on the potential economic impact on Massachusetts consumers and small businesses should make it a clear non-starter. **I strongly urge you to not enact the MA CHS rules until a comprehensive study with adequate public input looking at economic, energy security, fairness across ALL hydrocarbon users is completed.**

I remain optimistic that with enough consideration, due diligence and planning that a MA Clean Heat Standard that makes sense for all and contributes to achieving the MA climate goals can be implemented in the future.

Sincerely, Charity Simard

VIA EMAIL TO climate.strategies@mass.gov

May 3, 2023

Bonnie Heiple, Commissioner
Department of Environmental Protection
100 Cambridge St., Suite 900
Boston, MA 02114

RE: Mass Save Program Administrators' Joint Comments on Clean Heat Standard Discussion Document

Dear Commissioner Heiple:

As the Program Administrators ("PAs") of the Mass Save® energy efficiency program,[1] we thank you for the opportunity to respond to Massachusetts Department of Environmental Protection's ("MassDEP") initial discussion document regarding a potential Clean Heat Standard and related regulations. We look forward to engaging with MassDEP and other stakeholders throughout this process, including at any technical workshops focused on the design of a Clean Heat Standard. We write to provide these initial comments to highlight certain issues and concerns, particularly the importance of the smooth integration of a Clean Heat Standard with the Mass Save program. Each of the individual PAs may also file additional company-specific comments.

Now in its fifth Three-Year Plan term, the Mass Save program has consistently ranked among the top two statewide energy efficiency programs in the nation because of its success transforming the lighting market to adopt LEDs and promoting weatherization and efficient heating, among other measures. Increasingly, the Mass Save program is evolving into an electrification and decarbonization program, with a particular focus during the current 2022-24 term on electrifying heating through the deployment of air source heat pumps. The PAs are pleased to report that they exceeded their planned target for residential heat pump deployments in 2022, with continued progress anticipated in 2023 and 2024. Of equal importance, the PAs are also redoubling their efforts working with the Low-Income Energy Affordability Network ("LEAN") to ensure that low- and moderate-income ("LMI") communities benefit from investments in energy efficiency and clean heating.

[1] The Massachusetts Program Administrators are: The Berkshire Gas Company, Fitchburg Gas & Electric Light Company d/b/a Unitil, Liberty Utilities (New England Natural Gas Company) Corp. d/b/a Liberty, Massachusetts Electric Company, Nantucket Electric Company, Boston Gas Company and former Colonial Gas Company, each d/b/a National Grid, NSTAR Electric Company, NSTAR Gas Company and Eversource Gas Company of Massachusetts, each d/b/a Eversource Energy, and Cape Light Compact JPE.

An effective Clean Heat Standard should integrate seamlessly with the existing Mass Save program. It should support both the further deployment of demand-reducing measures like weatherization and the electrification of heat, and it should encourage the optimal use of heating systems, including those that continue to include gas-fired components. An effective Clean Heat Standard should leverage the progress the PAs have made thus far in transforming the market for heat pumps, particularly building the contractor workforce to deploy these systems. A well-designed Clean Heat Standard should reach important sectors of the market not covered by the Mass Save program, including municipal gas and electric territories. At the same time, a Clean Heat Standard should employ flexibility and market mechanisms to facilitate compliance. Further, any compliance assurance and verification mechanisms should give due consideration to customer privacy concerns. A Clean Heat Standard's effectiveness in driving down GHG emissions should be the principal metric for determining the success of the program.

Equity and environmental justice are key pillars of the 2022-24 Energy Efficiency plan, and they should be central considerations in the design of a Clean Heat Standard. The PAs have ambitious targets for serving income-eligible customers, who are offered increased incentives through the PAs' work with LEAN. Requiring a specified percentage of credits to be generated in LMI communities, directing an appropriate share of ACP revenues to LMI communities, and credit multipliers for work in LMI communities could all be appropriate tools to promote equity and environmental justice. However, the PAs stress that in the near term, transitioning to clean fuels may have the impact of increasing the energy burden of LMI communities if clean heat fuels are more costly. Accordingly, the PAs recommend that DEP direct a substantial portion of any funds raised by the Clean Heat Standard towards supporting LMI customers. This support could include direct assistance for energy bills or lowering energy rates by offsetting the Energy Efficiency Surcharge. The PAs also stress the importance of directing additional funds to offset the costs of clean heating investments and operational costs from the general state budget, remaining ARPA funds, or other outside sources.

Thank you for the opportunity to comment on MassDEP's discussion document for a Clean Heat Standard. Please do not hesitate to contact us as the regulatory process proceeds, and we look forward to further working with you on this critical topic.

///
///

Sincerely,

The Massachusetts Program Administrators

Katherine Peters/dbl
Katherine Peters
Director, Massachusetts Implementation
Eversource Energy

Christopher Porter/dbl
Christopher Porter
Director, Customer Energy Management
National Grid

Cindy Carroll/dbl
Cindy L. Carroll
Vice President, Customer Energy Solutions
Unitil Service Corp.

Hammad Chaudhry/dbl
Hammad Chaudhry
Senior Manager
The Berkshire Gas Company

Kimberly Dragoo/dbl
Kimberly Dragoo
Senior Manager, Energy Efficiency
Liberty Utilities

Margaret Downey/dbl
Margaret T. Downey
Administrator
Cape Light Compact JPE

MATEP

May 1, 2023

Sent via electronic correspondence to climate.strategies@mass.gov

Massachusetts Department of Environmental Protection
100 Cambridge Street
Suite 900
Boston, MA 02114

RE: Comments on the MassDEP Stakeholder Discussion Document for a Clean Heat Standard Program Design

To whom it may concern,

The Medical Area Total Energy Plant ("MATEP") appreciates the opportunity to provide comments relating to the Department of Environmental Protection's Stakeholder Discussion Document on a Clean Heat Program Design. Enclosed are MATEP's comments and recommendations for your consideration.

Sincerely,

/s/ Sarah Bresolin Silver

Sarah Bresolin Silver
Director, Government and Regulatory Affairs
Engie North America, Inc.

ENGIE North America Inc.
1360 Post Oak Boulevard, Suite 400
Houston, Texas 77056
Tel: 713.363.0000

COMMENTS OF MATEP, LLC ON THE MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION'S DEVELOPMENT OF DRAFT CLEAN HEAT STANDARD REGULATIONS

I. INTRODUCTION

MATEP, LLC is pleased to submit these comments in response to the Department of Environmental Protection's (Department) March 2023 request for public comment related to the Department's development of draft Clean Heat Standard (CHS) regulations (Discussion Document). MATEP supports the Department's effort to develop a regulatory standard for reducing gas emissions from fossil heating fuels. We look forward to working with the Department to develop regulations and standards suitable for microgrid and district heating and cooling systems, such as MATEP, which will build on the work MATEP is considering to decarbonize its operations.

II. ABOUT MATEP

The Medical Area Total Energy Plant (MATEP) facility, is a combined heat and power (CHP) plant, electricity microgrid and district heating and cooling network serving the needs of The Harvard Medical School and affiliated hospitals and research institutions in the Longwood Medical Area.[1] The facility is co-owned (with Axium Infrastructure) and fully operated by ENGIE North America, Inc. (ENGIE NA).

In 2018, ENGIE NA and Axium Infrastructure, operating jointly as Longwood Energy Partners ("LEP"), acquired MATEP. MATEP, a microgrid and district energy system is integral to the day-to-day operation of several world-renowned medical facilities, which are active in critical research initiatives and have approximately 2,000 hospital beds serving more than

[1] The six medical institutions are Beth Israel Deaconess Medical Center, Boston Children's Hospital, Brigham and Women's Hospital, Dana-Farber Cancer Institute, Harvard Medical School and School of Public Health and Joslin Diabetes Center. MATEP also provides steam-only service to a Merck facility in the Longwood neighborhood.

100,000 inpatients and 2.4 million outpatients annually. District energy networks are ideal for the energy needs of critical institutions because they are among the most efficient, reliable, and cost-effective ways to provide energy security while improving sustainability.

ENGIE NA's 33-year service agreement provides central plant management for the six main facilities. The agreement includes the microgrid, with a capacity to produce 94 MW of electricity, 1,050,000 lbs./hr. of steam, and 42,0000 tons of chilled water, serving an 11.2-million-square-foot district heating and cooling network in 74 buildings.

Importantly, MATEP is vastly more efficient than the electricity MATEP customers would otherwise draw from the electricity grid. For example, the efficiency of MATEP is approximately 65 percent compared with the overall Independent System Operator for New England's (ISO-NE) system efficiency of approximately 40 percent. On certain portions of the facility, MATEP produces 110 percent of the energy that it consumes. MATEP remains vital to the customers it serves.

III. ABOUT ENGIE SA and ENGIE NA

ENGIE SA, a global energy company and leader in the transition to low-carbon energy solutions and services has a mission to accelerate the transition towards a carbon-neutral world. ENGIE SA is a principal player globally in sustainable heating networks fed from renewable sources or waste heat, and in highly efficient cooling networks. Co-ownership and operation of MATEP is a testament to the work ENGIE NA is doing to accelerate the transition to carbon-neutrality in the Commonwealth.

ENGIE NA participates in several aspects of the energy economy in the Commonwealth as well as across the United States. ENGIE NA owns and operates 5 GW of grid-scale and distributed renewable and energy storage projects, some of which participate in the

Massachusetts programs. We also supply natural gas and electricity to 40,000 corporate and industrial customers, manage assets in multiple wholesale competitive markets and have a 1 GW of green hydrogen and sustainable fuels ambition by 2030.

IV. COMMENTS

a. The Department Should Consider Conducting Focused Outreach Specific to District Energy Systems.

MATEP appreciates the opportunity to provide comment prior to the Department's development of draft Clean Heat Standard regulations. This will allow time for the Department to engage with all stakeholders whose perspectives need to be considered during the regulatory process.

Specifically, MATEP requests that the Department consider conducting focused outreach to the multiple district energy systems that serve urban communities in the Commonwealth. Not only is each system unique, but the systems are highly complex and face their own challenges to decarbonization. For example, these systems provide electric and gas distribution-like service to their customers but are also themselves customers of the electric distribution and local gas distribution companies. However, there is no analogue to the additional services that MATEP provides to its customers including high pressure steam and cooling.

Outreach to district energy systems may also assist the Department in implementing recommendations from the Clean Heat Commission, detailed in their Final Report regarding potential transitions away from existing pipeline gas infrastructure to networked geothermal districts.[2]

[2] Massachusetts Commission on Clean Heat, *Final Report,* (November 30, 2022), at pp. 9, 20, 47.

b. The Department Should Capture Multiple Technologies for Eligibility in the Draft CHS Regulations.

In its Discussion Document the Department requests information on what counts as clean energy that can be awarded compliance credits.[3] Given the Commonwealth's desire to decarbonize at a rapid but responsible pace, the CHS Regulations should be inclusive of the technologies and associated infrastructure upgrades that will enable the decarbonization of buildings.

In response to the City of Boston's Building Emissions Reduction and Disclosure Ordinance (BERDO) in alignment with ENGIE's mission to be a leader in the net-zero carbon transition, MATEP has invested significant resources developing possible decarbonization pathways for the customers that it serves in the Longwood Medical Area (LMA). MATEP has performed extensive technical and economic analyses evaluating the most efficient and economic solutions. However, given the complexity of MATEP's operations, the size of the facility, and the exigent need that the hospitals and academic and research facilities have for reliable power, the decarbonization process is not simply a matter of retrofitting either the existing plant or individual campuses or buildings with heat pumps. The decarbonation of the LMA will be a multi-decade, multi-million-dollar effort.

Decarbonization efforts will require a thoughtful and highly planned implementation schedule so as not to disrupt the provision of electricity, heat and cooling to the buildings served by MATEP in the LMA. Any efforts on the part of MATEP and/or its end use customers will likely require significant upgrades to the electrical transmission and distribution infrastructure in

[3] Massachusetts Department of Energy of Environmental Protection, *Stakeholder Discussion Document Clean Heat Standard Program Design,* (March 2023), at pp. 6-7.

the LMA, and may ultimately be dependent upon the successful decarbonization of the electricity and fuels being provided to the area from the local electric and gas distribution companies.

c. The Draft CHS Regulations Should Provide Compliance Flexibility Where Appropriate.

Without compromising its decarbonization effort or goal, it is reasonable and possible for the Department to permit alternative or flexible pathways for facilities to comply. Given that facilities vary in size, employ different technologies and serve diverse customers in different geographies, it is essential that the Department consider how best each facility can comply.

Initially, MATEP recommends that the Department consider a flexible compliance term and the ability to comply over multiple years, as suggested in the Discussion Document.[4] Many of MATEP's possible decarbonization projects will be performed over multiple years because of their complexity, high cost and the need to maintain operations throughout the technology transitions.

MATEP also encourages the Department to provide compliance flexibility on the basis that not all technologies needed to enable the facility's decarbonization exist or are yet commercially available. For example, the production of green hydrogen and associated methods of transportation and storage and related technologies are either not at commercial scale, are not approved for use, or do not yet exist, but may provide significant ability to decarbonize once available for use.

Finally, because of the nature of our system and our interconnection with both the local gas distribution system and the electricity grid, the decarbonization of the power and fuels that we utilize in our processes depends on distribution companies' decarbonization of their own

[4] *Supra* note 3 at pp. 7-8.

systems. MATEP understands that these are considerations that the Department will be taking into account during the development of the Draft CHS Regulations.

d. MATEP Supports the Development of the Draft CHS Regulations

MATEP supports the development of the draft CHS Regulations to reduce greenhouse gas (GHG) emissions in the Commonwealth. If implemented, it will become a helpful method of supporting the decarbonization transition.

MATEP has experienced firsthand the significant benefits that state incentive programs and standards can provide to ratepayers as well as the impact programs can have on altering participant behavior to achieve a program's stated purpose as well as state goals.

For example, over the past ten years the Alternative Portfolio (APS) program has benefited ratepayers in several ways. Primarily, ratepayers are receiving benefits in the form of more cost effective and cleaner energy generation. The program achieves this goal by encouraging the development of innovative technologies and supporting generation owners' investment in innovative technology adoption. The APS incentive has been instrumental to the investment decisions made regarding the acquisition and operation of the MATEP facility. MATEP's decision to invest in newer, cleaner technology has been predicated, in part, on the incentive support provided by the APS program.

e. Reporting and Verification Should not be Burdensome and Annual Compliance Reports Should be Published by the Department Promptly.

MATEP understands that reporting and verification are appropriate and necessary to track the Commonwealth's and participants' success in implementing decarbonization strategies, policies, and technologies. MATEP recommends that the Department consider reporting mechanisms that do not overly burden the entity that bears the obligation to report. This will ensure that entities report in a transparent and timely manner.

Further, for transparency and the health of a CHS, information gathered by the Department and/or synthesized into a report, such as an Annual Compliance Report, should be made public promptly and regularly. A lack of regular reporting may weaken the fundamental understanding, transparency, and health of a program.

f. Careful Consideration Should be Made Regarding Interaction of the CHS Regulations with the Alternative Portfolio Standard Program.

MATEP appreciates the Department's interest in better understanding and addressing how the development of the CHS Regulations will impact the APS program. While interest in renewable and alternative resource contributions to carbon reduction initiatives continue to evolve, a gradual glide path to implementing any changes to the APS is essential to maintaining stability in the markets. A transparent and multi-year schedule of requirements and costs both for the APS (and other RPS programs that may be impacted) and the newly developed CHS program is critical to the health of the well-meaning programs and to support the Commonwealth's sustainability goals.

V. CONCLUSION

MATEP thanks the Department for the opportunity to comment on the development of draft CHS Regulations. MATEP is available to discuss any of the above recommendations further and looks forward to engaging with the Department throughout the stakeholder process.

May 1, 2023

Massachusetts Department of Environmental Protection
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: Massachusetts Clean Heat Standard Stakeholder Input

Dear Commissioner Heiple,

The Massachusetts Climate Action Network (MCAN) appreciates the opportunity to provide comments to inform the development of a proposed Clean Heat Standard (CHS) regulation and related heating fuel supplier reporting requirements. MCAN is happy to see the Department of Environmental Protection taking initial steps to implement a CHS. We believe that a CHS will be a necessary and powerful tool in meeting our legally binding state climate targets and transitioning Massachusetts to a clean energy future.

In addition to the recommendations enclosed, MCAN is also a signatory to the comments submitted by Conservation Law Foundation, Green Energy Consumers, Acadia Center, Pipeline Awareness Network, and HEET. We ask that the MassDEP considers and incorporates the detailed recommendations put forward in those comments.

MCAN urges the DEP to center equity and environmental justice in the program design and implementation of the CHS. The DEP should specifically solicit and incorporate input from environmental justice communities and organizations, housing justice advocates, and low-income residents. It must also ensure that the CHS does not disproportionately harm low income and environmental justice communities by increasing costs for those who are most in need. Climate action cannot be taken at the expense of our most vulnerable communities.

MCAN also strongly encourages DEP to include municipal utilities that provide gas services into the CHS and require them to meet the same standards as the rest of the state. Past exemptions of municipal utilities from critical climate regulations have led to an unnecessary lag in the progress that municipal utilities, on aggregate, have made to transition to clean energy. If we want to ensure that all communities are transitioning to clean heat, we must not exclude municipal utilities from this discussion and subsequent regulations.

We thank the Massachusetts Department of Environmental Protection and Commissioner Heiple for advancing a Clean Heat Standard Program Design and look forward to future opportunities to provide more in-depth recommendations.

Thank you for your consideration.

Sincerely,

Miranda Doleo

Miranda D'Oleo
Buildings Campaign Director
Massachusetts Climate Action Network
miranda@massclimateaction.net

MASS COALITION for sustainable energy

Bonnie Heiple, Commissioner
Department of Environmental Protection
100 Cambridge St Suite 900
Boston, MA 02114

May 01, 2023

RE: MASSACHUSETTS CLEAN HEAT STANDARD STAKEHOLDER COMMENT

Dear Commissioner Heiple,

Thank you for this opportunity to comment on Clean Heat Standard regulations. The Massachusetts Coalition for Sustainable Energy (MCSE)—representing nearly two dozen of the Commonwealth's largest business, employer, housing, labor, Chambers of Commerce, and trade associations—urges the Healey Administration to craft regulations that prioritize achievable and realistic strategies and technologies to reach our climate objectives while maintaining the Commonwealth's national leadership profile as a sustainable economic development role model in addressing climate change. We appreciate the importance of this public policy issue and thank you for the enormous amount of work and resource that you are dedicating to this urgent responsibility.

While we look forward to providing more substantive comments once draft regulations are made public, we hope that you will consider the following as you do this important work:

1) **Incorporate Multiple Decarbonization Pathways.** We know from our own work on the Clean Heat Commission, as a stakeholder in the DPU future of natural gas proceeding that now-Governor Healey initiated and through our participation in the DoER stretch energy code process that the Commonwealth is best served by multiple pathways to decarbonization. Certainly, expanding electrification will play a critical role in delivering home heating solutions across the Commonwealth. However, given the enormity of our task and the expected strain on our electric grid, we must also incorporate clean alternatives such as hydrogen and renewable natural gas which are viable decarbonizing pathways. Such options avoid billions of dollars in new costs and broaden the portfolio of options that can actually get us to net-zero outcomes. At a moment when we must reduce emissions by 2030, we cannot take those pathways off the table.

2) **Robustly Debate Economic Implications.** We know from the work of our union brothers and sisters who have installed and maintain our pipeline infrastructure how many good-paying jobs rely on today's transmission and distribution systems. This workforce also has expertise in operating a multi-billion-dollar infrastructure that ratepayers have

already paid for. In addition, at a time when housing costs are already astronomical, we must ensure we deliver clean heat solutions that are cost-effective and accessible to all populations and demographics.

3) **Allow for a Robust Public Input Process.** We know from several years of experience in this subject matter that building sector heating needs are complex. Policy undertakings that seek to affect behaviour in this arena are, by their nature, major and very impactful. The more input that is provided by the commercial, residential and consumer communities the greater the capacity for broad public support and acceptance.

4) **Consider The Work of other Jurisdictions.** We are fortunate that the Commonwealth is not the only place looking to sustainably reduce emissions. Other states, and other countries, particularly those with broad seasonal changes in temperature like Massachusetts offer examples, best practices and lessons learned in tackling a challenge this large. We think that it is worth understanding how regulators elsewhere measure and identify carbon emissions and define net actual realized reductions by using electricity to heat buildings. This winter, an unusually mild one by New England standards, saw large supplies of diesel oil and even coal generating electrical power. Increasing retail demand for electricity without a commensurate supply does NOT sustainably advance responsible cost or emission reduction strategy.

We sincerely want to see this process work and look forward to participating in it every step of the way. We are happy to meet and work with you to ensure we not only reduce the Commonwealth's carbon footprint but do so by incorporating and valuing the real-world perspectives necessary to ensure that we meet the needs of the diverse sectors and employers of the Massachusetts economy. Together, we believe we can make this possible.

Sincerely,

Bill Ryan
Massachusetts Coalition for Sustainable Energy

MASS COALITION
for sustainable energy

MASSACHUSETTS ENERGY MARKETERS ASSOCIATION

April 28, 2023

TO: Massachusetts Department of Environmental Protection
SUBJECT: Clean Heat Standard

On behalf of the Massachusetts Energy Marketers Association, which represents the heating oil industry across the state and has done so for sixty-eight years, I submit the following comments to the Massachusetts Department of Environmental Protection (DEP) on their **Discussion Draft Regulation** and **Stakeholder Discussion Document Program Design** for a Clean Heat Standard (CHS) for the Commonwealth.

Overview

Since the early 1950's the heating oil industry has provided warmth, comfort and outstanding service to homes and businesses across Massachusetts and has strived to and succeeded in improving the energy efficiency of heating oil equipment and the environmental impact of its liquid fuel.

And for more than fifteen years, the heating oil industry in Massachusetts has consistently demonstrated that it is cognizant of the impacts of climate change to our environment and our citizens; and is committed to being a partner with state officials to find workable, economical, and sensible solutions to reduce greenhouse gas emissions (GHG) statewide.

For example, the industry supported the legislative debate and final passage in 2008 of the Global Warming Solutions Act, the Green Communities Act, and the Clean Energy Biofuels Act, which was never implemented for questionable reasons and could have provided significant GHG reductions in both the thermal and transportation sectors.

Further evidence of the industry's commitment to state-supported climate change, environmental and energy efficiency programs; as well as programs to aid the low-income and environmental justice (EJ) community is significant.

The industry has been, and continues to be, a member of the Department of Energy Resources' (DOER) Energy Efficiency Advisory Council (EEAC). The industry was a lead voice in DOER's promulgation of regulations for the Alternative Energy Portfolio Standard (APS), and since 2018, almost 80 retail companies have participated in the APS program by delivering low carbon, renewable "eligible" liquid biofuel to tens of thousands of homes and businesses statewide.

And the industry has proven it is the backbone for fuel delivered at a highly discounted rate to Low Income Heating Assistance Program (LIHEAP) qualified customers.

Despite this laudable cooperative work by the heating oil industry, state energy and environmental officials and Beacon Hill lawmakers have done everything in their power to spearhead the extinction of the heating oil industry.

As cited, state officials scuttled the implementation of the 2008 Clean Energy Biofuels Act and squandered more than a decade's worth of carbon reductions for home heating oil and on-road diesel fuel.

And even though New York, Rhode Island, Connecticut, California, and Oregon, along with the U.S. Environmental Protection Agency recognize soy-based biofuel as an advanced feedstock, the DOER's APS program fails to embrace soy-based biodiesel despite empirical evidence supporting the GHG reduction capabilities of the feedstock.

Additionally, state lawmakers, regulators and the EEAC have favored electric heat pumps as the panacea for climate change mitigation even though heat pumps are very costly to install, very costly to operate, and perform poorly in cold winter temperatures. The heating oil industry stands by these claims because hundreds of retail heating oil companies in Massachusetts install, and service electric pumps and many retailers are part of Mass Save's Heat Pump Installer Network.

Furthermore, as opposed to supporting the accelerated use of readily available, renewable biofuels that have an immediate impact on reducing carbon emissions, the DEP, and others in state government favor electric heat pumps even though they are powered by an electric grid with no commercially defined plan for producing power from totally renewable energy sources.

DEP's **Discussion Draft Regulation** and **Stakeholder Discussion Document Program Design** for a CHS represents the latest effort by Massachusetts officials to eradicate the heating oil industry.

<u>Comments on DEP's Documents</u>

- Describing a CHS as a "cost-effective policy tool" (Page 1 of the **Stakeholder Discussion Document Program Design**) is disingenuous. A CHS is nothing more than an escalating tax on fossil fuels to encourage "electrification" and eliminate fossil fuels for the thermal sector. The escalating tax will have a dramatic impact on homeowners and businesses across Massachusetts.

- Furthermore, DEP's statement on page 3 of the **Stakeholder Discussion Document Program Design** that "any incremental program costs will be spread widely across consumers in Massachusetts," given that "energy suppliers, not individual energy customers, are subject to the credit purchasing requirement," is false. Like all fuel taxes, the cost will be passed along to the consumer. The reporting requirements being considered by DEP for both wholesale energy suppliers and retail companies are very burdensome, and if promulgated will add additional administrative costs for these companies that will be passed on to consumers.

- On page 4 of the **Stakeholder Discussion Document Program Design**, the suggestion that "heating energy suppliers might also be required to demonstrate the conversion of approximately 3% of their customers to electric heat each year," is unacceptable to our association. The association has already met with legal counsel on this matter to investigate the legality of DEP's efforts to enact such a mandate.

- Regarding "obligated parties" for delivered fuels (heating oil and propane) under a potential CHS, retail heating oil and propane companies should be the designated obligated parties as opposed to wholesale liquid fuel and propane suppliers. Although the universe of wholesale liquid fuel and propane suppliers is smaller than retail companies in Massachusetts and neighboring states, wholesalers do not know the final destination of heating oil and propane gallons once they leave the terminal gate.

- The DEP's statements on page 6 of the **Stakeholder Discussion Document Program Design** regarding limiting credit generation only for "bioenergy that is manufactured from waste feedstocks, "and DEP's continued reluctance to allow soy-based biofuel to help Massachusetts reduce carbon emissions because it is a "crop-based" biofuel with "significant and highly uncertain indirect land use and emissions impacts," is most puzzling given existing, nationally-recognized research on this subject.

- How is it that Massachusetts officials continue to ignore the science supporting the use and effectiveness of advanced biofuel feedstocks including soy-based biofuel? And how is it that Massachusetts continues its intransience of this subject when nearby states with biofuel mandates (CT, NY & RI) do not limit feedstock eligibility, and California and Oregon, the unquestionable leaders for a Low Carbon Fuel Standard, allow for soy-based biofuel in their programs?

- Further, because of this insular view on biofuel feedstocks, Massachusetts has chosen to thwart its ability to make measurable progress in reducing GHG emissions in the thermal sector. As evidence of this fact, DEP should consider the data compiled in April 2023 by Diversified Energy Specialists (DES), a Wilmington-based aggregator for the DOER's APS program.

- DES calculated the minting of liquid biofuels Alternative Energy Certificates (AECs) for the APS program in Q3 & Q4 of 2022 and found that liquid biofuels minted 163,094 AECs, the lowest minting since 2018 and far below the Q3 & Q4 cap of 239,937.

- DES also documented how liquid biofuel generation has looked in the APS historically.

- **2017 Retroactive:** 419,578 (cap at 408,082) – 14.1M gallons B100
- **2018:** 292,748 (cap at 421,779) – 9.8M gallons B100
- **2019:** 557,616 (cap at 434,300) – 18.7M gallons B100
- **2020:** 678,078 (cap at 464,483) – 22.8M gallons B100
- **2021:** 475,893 (cap at 469,410) – 16.0M gallons B100
- **2022:** 392,364 (cap at 479,874) – 13.1M gallons B100

- The DES data clearly demonstrates that limiting the APS program to only waste-feedstocks such as used cooking oil (UCO), a feedstock that is not scalable, and will not have a meaningful impact on GHG reductions for Massachusetts moving forward. The APS program and a potential CHS must expand feedstock eligibility to displace hundreds of millions of gallons of heating oil, vastly improve GHG reductions, and demonstrate that state officials are committed to finding every available pathway to mitigate climate change.

- Much like DEP's illogical support for only biofuel produced from waste feedstocks, the DEP's suggestion that it might not embrace the GREET model for applying credit values and GHG emissions calculations for a potential CHS is unscientific. The GREET model is the state-of-the art method for full life-cycle analysis for transportation and heating fuels, advanced biofuels, and the electric grid and DEP should not create a "simpler system appropriate for Massachusetts' focus on electrification." (Page 6 of the **Stakeholder Discussion Document Program Design**.)

- A potential CHS must be technology neutral and any attempt by DEP to assign zero emissions to electricity does not account for the full life cycle of electric heats pumps. Electricity's carbon footprint and its impact on the environment in Massachusetts must be scored along with all other energy sources that fall under a CHS.

- Retail heating oil companies and wholesale liquid fuel suppliers sign fixed price contracts for supplies of heating oil eighteen months in advance. An escalating CHS tax on heating oil will have an impact on this standard industry practice for businesses and consumers alike.

Michael Ferrante | President
Massachusetts Energy Marketers Association
36 Jonspin Road | Wilmington, MA 01887 | Tel: 781-365-0844 | www.massenergymarketers.org

nationalgrid

Bonnie Heiple, Commissioner
Department of Environmental Protection
100 Cambridge St Suite 900
Boston, MA 02114

May 1, 2023

Dear Commissioner Heiple,

On behalf of National Grid, thank you for the opportunity to provide comments regarding the development of draft Clean Heat Standard regulations.

Heating (residential, commercial, and industrial) is the largest segment of Massachusetts' energy economy according to the US Energy Information Administration, and the Massachusetts 2050 Decarbonization Roadmap notes that buildings and industry are responsible for contributing approximately 32% of total economy-wide greenhouse gas emissions in the Commonwealth. Reducing emissions related to heat energy in these sectors will be essential for reaching the Commonwealth's greenhouse gas emission reduction goals in line with the limits and sub-limits established under the Global Warming Solutions Act and Roadmap Act. National Grid's vision for achieving net-zero emissions and eliminating fossil fuels by 2050 is highly aligned with the Commonwealth's goals, including the findings of the 2050 Decarbonization Roadmap and the 2025/2030 Clean Energy and Climate Plans (CECPs), which include an emphasis on electrification of buildings and expanded energy efficiency as foundational strategies.

National Grid believes the Clean Heat Standard can be a critically important tool to support the decarbonization of heat in Massachusetts, and to enable a just and equitable transition to a net-zero energy system. We look forward to contributing to this discussion to help ensure Massachusetts' programs and policies will generate real emissions reductions in line with our shared 2050 targets, while also balancing affordability and environmental justice considerations.

We understand the scope of this rulemaking will ultimately include all aspects of a performance standard to reduce greenhouse gas emissions from residential, commercial, industrial heating, and that these initial public comments are intended to inform development of draft regulations. National Grid looks forward to the opportunity to provide further comments once draft regulations have been developed and released for public comment.

National Grid offers the following comments for your consideration, organized according to the relevant topic in the "Stakeholder Discussion Document":

Topic 1: Setting the Standard

Ensuring a Just and Equitable Energy Transition for All

Implementing a Clean Heat Standard in Massachusetts is an important tool for achieving the Commonwealth's emissions reduction and climate justice targets. We urge the Department to establish a Clean Heat Standard stringent enough to ensure the Commonwealth's bold and important emissions reduction targets are achieved. Robust protections must be incorporated into the standards to ensure full consideration of potential impacts to and opportunities for participation by low-to-moderate income (LMI) customers and those in environmental justice (EJ) populations. Importantly, the standard should ensure that no one is left behind or unnecessarily burdened by the transition away from traditional/conventional fuels to clean heat solutions. For example, National Grid agrees with the "discussion document" that the Clean Heat Standard could require obligated parties to procure a specified number of credits which benefit LMI and EJ populations. Further, funds from Alternative Compliance Payments could

be set aside to support programs which benefit LMI and EJ populations. Steps should be taken to mitigate potential impacts on affordable housing as well.

Considerations must also be made for a just and equitable transition for gas industry workers, and to ensure the Commonwealth's energy workforce is adequately positioned to deliver the energy transition for the Commonwealth. For example, the unions that represent more than 3,300 National Grid team members in Massachusetts -- United Steel Workers (USW) Local 12003, Local 12012-404, Local 13507 and Utility Workers Union of America (UWUA) Local 318, Local 250, and Local 369 -- must have a seat at the table in the discussions concerning this shift in energy usage.

Full Life Cycle Emissions Accounting
National Grid agrees with the Clean Heat Commission's recommendation that full life cycle analysis, including all upstream and downstream greenhouse gas flows, is the most appropriate approach for determining the compliance value of all qualifying technologies. Accordingly, we recommend that the CHS should be expressed in terms of full life cycle GHG emissions reductions. The compliance methodology should allocate credits according to actual life cycle emissions associated with all qualifying technologies, while also being as simple as possible. Life cycle analysis enables emissions from a diverse array of technologies, including electric heating solutions as well as alternative fuels, to be quantified under a common methodology, allowing for different technologies to participate in the CHS despite differences in how each technology emits greenhouse gases.

Established Scientific Accounting Methodology
The CHS should utilize established scientific standards to quantify life cycle emissions, such as Argonne National Labs' GREET model, which is recognized as the gold standard for life cycle analysis. For example, GREET is specified in the federal Inflation Reduction Act (IRA) as the methodology to calculate life cycle emissions for new clean energy tax credit programs, and is used by the California Air Resources Board to assess compliance with the state's Low-Carbon Fuel Standard.

Standard Should Scale Over Time
The compliance obligation should scale up over time so that obligated parties would be required to retire an increasing number of credits in future years, consistent with the Commonwealth's GHG reduction targets. A phased in approach will help mitigate price shock. Steeper emissions reductions may be expected in the future based on cheaper and more advanced technologies being available. A restrictive credit cap in the initial stages of the Clean Heat Standard may result in insufficient allowances, which in turn could result in increased costs and potential reliability concerns.

Topic 2: Regulated Heating Energy Suppliers

Compliance Obligations Should Reside with Energy Suppliers
National Grid agrees with the "discussion document" that energy suppliers should be the obligated entities under the CHS. Each energy supplier, who best understands their specific customers and who likely already works with their customers to determine optimal decarbonization strategies, should be responsible for complying with the Clean Heat Standard to reduce their customers' emissions. This should ensure that the Clean Heat Standard aligns with the Commonwealth's climate goals.

National Grid recommends that the obligated entity for pipeline-delivered gas should be the company which supplies gas to the customer, whether that entity is a gas utility or a competitive supplier. The Renewable Portfolio Standard (RPS) is an example of a successful, existing policy where the compliance obligation is on the energy supplier. Similar to the RPS, energy suppliers would be responsible for obtaining an increasing amount of clean heat technologies under a CHS.

As the gas supplier under default commodity supply, National Grid would pass along the price signal under a Clean Heat Standard to our customers as a commodity surcharge. This price signal would encourage reduction in the use of fossil fuels in favor of cleaner alternatives, such as energy efficiency measures, heat pumps, and decarbonized fuels.

nationalgrid

Topic 3: Credit Generation

Clean Heat Standard Should be Technology Neutral

National Grid agrees with the policy outlined in the CECPs that electrification and energy efficiency should be the cornerstone strategies for decarbonizing buildings in Massachusetts, and is actively working to scale up deployment of those essential solutions today. For example, National Grid's Massachusetts energy efficiency programs embarked on their first year of a three-year plan with ambitious goals focused on reducing greenhouse gas emissions at a pace in alignment with state policy goals. The Company saw incredible uptake in its Residential programs for heat pumps and exceeded first year goals installing heat pumps in over 8,400 homes, which is a 2x growth over 2021 results. The Company recognizes the immense importance of energy efficiency and electrification as a decarbonization strategy and the investments we are making now, and in the future, are aimed at aligning with state decarbonization goals. The Company would recommend that some portion of the collections from the Clean Heat Standard be directed to Program Administrators to offset costs for their energy efficiency and electrification programs.

National Grid also recognizes the evidence, as noted in the 2050 CECP, that there will continue to be a need for fuel combustion in 2050 for hard-to-electrify applications, including in buildings, such that alternative, low-carbon, non-fossil fuels will play an important role in ensuring families and businesses across the Commonwealth have access to decarbonized heat. Consequently, National Grid finds that a technology neutral Clean Heat Standard, with compliance determined on the basis of actual greenhouse gas emissions reductions from qualified technologies, will present the most cost-effective way for building decarbonization. The Clean Heat Standard should support a broad portfolio of technologies and should promote competition based on cost effectiveness of reducing emissions. Eligible technologies to support deep decarbonization in the building sector should include, but not be limited to, air source heat pumps, networked thermal energy loops such as geothermal and other renewable thermal solutions, and alternative low-carbon fuels including renewable natural gas (RNG) and clean hydrogen. CHS program design elements, including Alternative Compliance Payment levels if applicable, should be set to encourage the broadest set of qualifying technologies.

There are meaningful near-term opportunities to reduce greenhouse gas emissions from heating applications by repurposing existing infrastructure to deliver alternative fuels. Displacing fossil fuels with low-carbon alternative fuels is complimentary with rapidly accelerating deployment of energy efficiency and electrification technologies. Alternative fuels can play an important role alongside tools such as electrification and energy efficiency by reducing emissions from difficult-to-electrify applications. Repurposing existing infrastructure, including the existing gas distribution network to deliver low-carbon alternative fuels such as RNG and hydrogen can help make the energy transition more affordable by reducing the need for new electric infrastructure construction, which will present affordability challenges. As such, the delivery network that is currently used for natural gas can play an integral role in the Commonwealth's net-zero, fossil-free future, and the value of this network as a critical tool for decarbonizing heat must not be overlooked in CHS program design.

While many customers may be readily able to convert to a fully electrified heating system, others, including many LMI customers, will face barriers to electrification that could put affordable decarbonization out of reach for many if a diverse array of clean heat options is not available. For example, clean heat options such as alternative fuels that avoid installation of costly new heating equipment can help make decarbonization more affordable and accessible to families, including LMI families, those in renter-occupied buildings, and others who may not be able to afford new heating equipment today.

Because all the tools discussed above can each play a role in facilitating building decarbonization, a technology neutral approach will help ensure development of a cost-effective pathway to attain the Commonwealth's critically important goals, while retaining customer choice. This flexibility is essential for realizing an affordable transition that is just, equitable, and durable, and for maximizing cost-effective emissions reductions.

nationalgrid

Topic 4: Compliance Flexibility and Revenue

Support for LMI and EJ Populations
As noted above, funds from ACPs or other revenue generating activities under the CHS, if applicable, should be made available to help make compliance more affordable for LMI families and EJ populations. Revenues could also be used to increase the supply of available credits through competitive grants or other mechanisms. All revenues should be used to support the goals of the CHS and should not be diverted for other purposes.

Topic 5: Reporting Requirements for Heating Energy Suppliers

Reporting Should Be Based on Life Cycle Analysis
As noted above, emissions reporting should be conducted under full life cycle GHG accounting, utilizing a scientifically accepted standard such as the GREET model. The "discussion draft" of emissions reporting requirements, at 310 CMR 7.75(f)d(d)3.3(iv), proposes that emissions from fuels other than natural gas, liquid distillate fuel, or propane should be calculated according to the CO2 emissions factor of "the fuel it is most similar to, can be blended with, or can substitute for." This approach is not consistent with the best available science and would result in inaccurate emissions accounting. Obligated entities should be required to report the actual emissions associated with the consumed fuel according to a full life-cycle analysis.

Thank you for the opportunity to provide these comments. National Grid stands ready to support the Healey-Driscoll Administration and the Department in your efforts to develop and implement a Clean Heat Standard that will achieve meaningful emissions reductions across the building sector while ensuring protections for the most vulnerable members of our communities and ensuring a just and equitable transition to a clean energy future.

Sincerely,

Sandy Grace

Sandy Grace
Vice President, US Policy & Regulatory Strategy
National Grid

Re: Request for comments on the Massachusetts Clean Heat Standard

These comments are submitted by New Buildings Institute (NBI). For questions, you may contact:

NBI: Jim Edelson, jim@newbuildings.org, (503)209-4625, 151 SW 1st Ave. Suite 300. Portland, OR 97204;

New Buildings Institute (NBI) supports reducing building sector emissions from heating in alignment with broader Massachusetts ambitions for climate action. NBI is supportive of having a reducing cap on emissions from heating in buildings in a Clean Heat Standard, but recognizes the complexity of establishing valid credits and setting baselines for the purpose of a CHS.

Our comments will focus on untangling the CHS credits from the range of mandatory building and building equipment policies that will or may be implemented during the period when credit obligations will be placed on regulated parties. We could comment on much more, but we think these issues are fundamental to the success of this policy - without them being disentangled, it is possible that the administrative burden of the policy may exceed its benefits, or the preference for other more direct regulatory obligations being placed on delivered fuels to buildings.

As a note, NBI's position is that placing the obligation on electric service providers is not in the best interest of the program. If electrification of buildings is a key lever in the Massachusetts climate strategy, which it is, and given the complexities of attributing "clean electrons" vs "dirty electrons" to either customers or, hence, to obligated CHS parties, and setting precise emissions reductions therefrom, the electric sector should not be part of this program. Those emissions presumably will be successfully reduced through RGGI and CES. CHS should be limited to delivered and piped fuels to buildings.

Though we do have comments on other topics, we will respond directly to topic #3.

Topic #3 – Credit Generation
Setting the rules for credit generation will be complex, will need to address numerous uncertainties and intangibles, and will be directly impacted by a range of other Massachusetts policies.

A. Setting baselines to avoid double-counting

Though we agree that credits should be generated for efficiency and fuel-switching measures generated through voluntary MassSave programs, we do not support any credits generated by actions taken in accordance with mandatory policies. Unlike voluntary programs, such as MassSave, actions due to requirements of law cannot be attributed to efforts beyond what is legally required, such as those CHS credits are designed to measure. This is not a question of allowing credits to be created for actions that are occurring to incentives; mandatory policies are the primary criteria for *setting the baseline.*

- There are many plausible policy paths to building decarbonization(including heating of buildings), many of which have successfully implemented or proposed for Massachusetts and other states. Notably among that set of mandatory building policies are base building codes, stretch building codes, building performance standards (BPS), appliance efficiency standards and appliance emission standards (based on Clean Air Act authority).

  So that means for setting the baseline for each potential credible action, two factors must be independently identified and summed together – **carbon intensity** (CI) reduction of fuel used (could be electrification, but also clean delivered fuels) and **efficiency** of fuel use. Both CI and efficiency taken together drive heating decarbonization, so one or the other, or both, should be attributable to a creditable activity - but it is essential that CI and efficiency each be evaluated independently for baselines because mandatory polices can, and do, impact them in independent ways . And, it is also critical that the CHS design correctly understand the packages and options that underly compliance strategies for building codes, such as Section C406 in the MA commercial code, and BPS, that depend heavily on what should be interpreted as a "heat pump requirement" - because the "heat pump path' allows leniency in another direction, and in that case the mandatory standard is what caused the heating choice. Boston's BPS, BERDO, has a basis in an emissions metric that directly points to a compliance path based on electrifying building equipment (reduction in carbon intensity) and becoming more efficient (using heat pumps instead of electric resistance). Heat pumps installed to achieve minimum compliance with the BERDO should not be credited within the CHS – that is, they should not be credited for their efficiency increases nor their reduction in CI as they were a necessary component in a building's compliance pat to meet BERDO.

B. **Accurately crediting CI reductions in delivered fuels**

NBI has been deeply engaged studying and proposing crediting mechanisms for reduced CI delivered fuel in the nation's energy codes. Our basic premise for building crediting follow the European Union precedent of crediting fuels with a demonstrate 70% reduction in CI from a fossil fuel baseline should qualify as a renewable fuel. Most importantly for the design of CHS credits, thought, is not the 70% threshold, but rather the mechanism for measuring, verifying and documenting accurate CI reduction levels in fuels delivered to buildings.

I with my colleagues authored the paper "A Codes and Standards Framework for Delivered Low and Zero Carbon Gaseous Fuels" that was published by ASHRAE (2023). For the purposes of the CHS, the most critical takeaway in our months of converting the ideas in this paper to live proposals for building codes is that the fuels must be measured in accordance with one of two "north star" standards: the EPA renewable fuel standard or the CA Low Carbon Fuel Standard, both of which rely upon the GREET software model for determining CI reductions. As stated in the referenced paper:

> California's LCFS standard assigns a carbon intensity (CI) in gCO_2e/MJ to gasoline, diesel fuel and their respective substitutes based on the life cycle greenhouse gas emission of each fuel type. The LCA includes direct effects such as production, transportation, and consumption of the fuel and indirect effects like changes in land use which is critical for biofuels. The direct effects of producing and using the fuel for vehicle use are calculated using the California Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (CA-GREET), which is a modified version of a national GREET model developed by Argonne National Labs. The indirect effects primarily associated with land use changes from the use of crop-based biofuels are calculated using Global Trade Analysis Project supplemented by the Agro-Ecological Zone Emissions Factor.

Only registration with, or calculations demonstrated to be in accordance with one of those two programs (with a Renewable Identification Number for the former, or as a listed LCFS in the latter) should qualify fuels for CI reduction credits in the CHS.

Here is the key verification language on CI verification referencing both EPA and CARB that is pending for the 2024 IECC and could be model language for consideration in the CHS draft rule.

> **DELIVERED LOW CARBON FUELS.** Fuels delivered to the building site where the sum of the greenhouse gases emitted throughout the production and use life cycle of the fuel, expressed on a per-unit-of-fuel-energy basis, is reduced compared to a fossil fuel equivalent.
>
> C405.15.2.2 Off-site contract and documentation. The *renewable energy* shall be delivered or credited to the building site under an energy contract with a duration of not less than 10 years. The contract shall be structured to survive a partial or full transfer of ownership of the building property. The total required off-site renewable ~~electrical~~ energy shall be procured in equal installments over the duration of the off-site contract. The property owner or owner's authorized agent shall demonstrate by a contract or a bill of lading that *delivered low carbon fuels* **comply with one or more of the following.:**
>
> 1. Renewable Diesel or Renewable Biodiesel with a Renewable Identification Number in accordance with EPA 40 CFR Part 80 Subpart M and be designated B99 or B100 in accordance with ASTM D6751.
> 2. Renewable Diesel or Renewable Biodiesel with a a Renewable Identification Number in accordance with EPA 40 CFR Part 80 Subpart M and be designated R99 or R100 in accordance with ASTM D975.
> 3. Have a life cycle carbon intensity no more than 25 gCO_2e/MJ when calculated in accordance with the methodology in Section 95488.3 Title 17, California Code of Regulations.

Serving main street energy providers since 1942

National Energy & Fuels Institute, Inc. - NEFI
DC Office: 1629 K Street NW, Ste. 300, Washington, DC 20006
MA Billing Office: 36 Jonspin Rd, PO Box 822 Wilmington, MA 01887
Phone: (617) 924-1000 • Fax: (508) 373-2740 • www.nefi.com

May 1, 2023

Submitted via email (climate.strategies@mass.gov)

The Honorable Bonnie Heiple
Commissioner
Massachusetts Department of Environmental Protection (DEP)
100 Cambridge Street Suite 900
Boston, MA 02114

Re: Massachusetts Clean Heat Standard Discussion Drafts for Program Design & Emissions Reporting Requirements for Heating Fuel Suppliers (March 2023)

Dear Commissioner Heiple:

Thank you for the opportunity to comment on the discussion draft documents for the proposed Clean Heat Standard (CHS) and related emissions reporting requirements for heating fuel suppliers (the discussion drafts). We write to express our concern that the proposed CHS will significantly harm small home energy providers and their employees and customers throughout the Commonwealth of Massachusetts and the broader New England region. While well intended, the program as envisioned by the Massachusetts Department of Environmental Protection (MassDEP) will increase harmful emissions, substantially increase home energy costs, and disadvantage vulnerable communities. We urge the Commonwealth to abandon its planned elimination of our small family businesses and work with them - *not against them* - to find common-sense, low-cost solutions for building decarbonization, including the deployment of renewable liquid heating fuels.

I. About Us.

The National Energy & Fuels Institute (NEFI), formerly the New England Fuel Institute, based in Wilmington, Massachusetts, has represented wholesale and retail distributors of liquid heating fuels and related services companies since 1942.[1] These businesses safely and reliably deliver warmth and comfort to nearly six million homes across the United States, including 662,000 homes in the Commonwealth alone.[2] Of the five billion gallons of heating oil and renewable liquid heating fuels used on average in the United States each winter, 85% is utilized by homes and businesses in the Northeast from Maryland to Maine.[3]

---

[1] NEFI changed its name and became a national association on July 1, 2020.
[2] This is based on data from the U.S. Census Bureau, American Community Survey (ACS), Fuel Oil Use by Occupied Housing Units, Five-Year Avg. (2017-2021). Percent (%) of homes is calculated as a percentage of total state occupied housing units.
[3] Source: U.S. Energy Information Administration (EIA).

Most of our retail members, often referred to as "heating fuel dealers," are small, multigenerational family-owned-and-operated businesses with an average of 28 full-time equivalent employees.[4] NEFI represents both fuel delivery and larger "full service" businesses that sell, install, and service residential and commercial HVAC systems, including liquid fuel (i.e., oil- and biofuel-fired) and gas furnaces, boilers, and water heaters. Many also sell, install, and service electric air source heat pumps (ASHPs) and heat pump water heaters. Unlike utilities, our members personally deliver heating fuels and related services to the home. As a result, they often have a personal relationship with their most loyal customers and are actively engaged in the communities they serve.

II. About Renewable Liquid Heating Fuels.

NEFI members in Massachusetts and throughout the Northeast are actively working to replace conventional home heating oil with renewable fuels to reduce greenhouse gas (GHG) emissions, support local economies, and contribute to the region's energy and environmental security. Many are blending ultra-low sulfur heating oil with biodiesel, commonly branded as Bioheat® Fuel, with up to 74% lower GHG emissions on average than conventional petroleum.[5,6] Biodiesel is produced from an array of sustainable feedstocks, including recycled cooking oils and fats and surplus vegetable oils.

Other advanced biofuels, including renewable diesel, are suitable for use in space heating applications, and cellulosic biofuels are in development that are designed to replace conventional petroleum-based home heating oil. One example is ethyl levulinate (EL), a net-negative carbon heating fuel that utilizes feedstocks found in abundance throughout the Northeast including sustainably harvested wood products, municipal solid waste, and forestry and agricultural residues.[7] On March 20, 2023, the Town of Lincoln, Maine approved a 20-year lease for a $100 million EL biorefinery located at a former mill site. It is estimated this multi-phase project will eventually create up to 500 jobs in New England and ultimately produce more than 30 million gallons of what will be the "single lowest carbon-intensity liquid fuel commercially available anywhere in the world."[8]

Renewable liquid heating fuels, including Bioheat® Fuel, renewable diesel, and EL offer an immediate "plug and play" solution that utilizes existing and well-regulated storage and distribution infrastructure and, with minor and very low-cost modifications,

---

[4] *2022 Energy Survey: Full Report – Overall Results*, Gray Gray & Gray, Canton, MA, 2022.
[5] Bioheat® Fuel is a registered trademark of Clean Fuels Alliance America (www.cleanfuels.org).
[6] Argonne National Laboratory; U.S. Department of Energy, Alternative Fuels Data Center, https://afdc.energy.gov/vehicles/diesels_emissions.html.
[7] A Biofine Developments Northeast Inc and EarthShift Labs 2019 GREET analysis shows EL reduces emissions by over 100% in heating applications.
[8] Bellavance, Megan, "Lincoln approves 20-plus year lease with Biofine to develop former pulp mill site," *News Center Maine,* March 22, 2023, available at https://www.newscentermaine.com/article/money/business/lincoln-approves-20-plus-year-lease-with-biofine-to-develop-former-pulp-mill-site-development-maine/97-c7f7af2c-c3eb-4ae2-b581-5a44478fe5a0.

work seamlessly in existing appliances to deliver immediate reductions in GHG emissions—all at little to no additional cost to the consumer.[9] Combined with residential energy efficiency and weatherization, these fuels are substantially reducing GHG emissions in residential and commercial buildings and provide our small family businesses and their customers a pathway to achieve net-zero emissions. Furthermore, they can do so without costly conversions of their entire home heating systems to other fuels or energy sources.

III. Comments on the CHS Discussion Drafts.

A. The main goal of the CHS is to install heat pumps, not reduce GHG emissions.

The CHS discussion draft openly admits the program is biased towards one specific fuel and technology. As stated therein, the objective of the CHS is ***not*** equitable reduction of greenhouse gas emissions, but rather "electrification of the thermal sector."[10] The MassDEP is misrepresenting the CHS as a market-driven emissions reduction program, not unlike a Low Carbon Fuels Standard (LCFS) utilized by some west coast states or the successful federal Renewable Fuels Standard (RFS). Both programs utilize tradeable credits to reward strategies that reduce GHG emissions. However, the discussion draft says the intent of these credits under the proposed CHS is to encourage contractors to "install clean electric heat pumps quickly and at the lowest possible cost to their customers," ***rather than*** reduce greenhouse gas emissions quickly and at the lowest possible cost to consumers. The CHS is intentionally designed to discourage, if not outright prevent adoption of *non-electric* low- or zero-carbon heating fuels and technologies in favor of air source heat pumps. The effect of this policy will be to restrict consumer choice and limit access to more immediate, practical, and cost-effective options for GHG reduction.

The proposed CHS will substantially increase the region's demand for electricity that will continue to be generated by fossil fuels for the foreseeable future, especially during the winter. Contrary to popular belief, electric heat pumps are not an emissions-free heating solution just because the on-site fuel source is not oil or gas. According to the Independent System Operators of New England (ISO-NE), fossil fuels continue to produce a majority of the region's electricity, especially during periods of peak demand.[11] For example, on December 24, 2022, fuel oil alone generated nearly 30% of the electricity across the six-states as temperatures in Massachusetts plummeted into the teens and natural gas was prioritized for residential space heating.[12]

---

[9] National Oilheat Research Alliance, *Developing a Renewable Biofuel Option for the Home Heating Sector: A Report to Congress, State Governments and Administrator of the Environmental Protection Agency*, at 18 (2015), available at https://noraweb.org/wp-content/uploads/2015/10/Developing-a-Renewable-Biofuel-Option-May-2015-R2.pdf.

[10] *Ibid.*

[11] https://www.iso-ne.com/about/key-stats/resource-mix.

[12] Willson, Miranda, "New England clean energy goals slam into oil reality," *E&E News*, January 18, 2023.

MassDEP must acknowledge that the source fuel for electric heat pumps is electricity generated by fossil fuels. This will continue to be the case until New England has resolved all major logistical and technological hurdles necessary and expended the enormous financial and political capital needed to ensure all the region's electricity is generated by renewable sources. To be successful, any state climate program, *especially one that aspires to be fair and market-based*, must account for all lifecycle GHG emissions, including on-site and source emissions. As for methods of measuring these emissions, we insist that the Commonwealth adopt Argonne National Laboratory's GREET life-cycle analysis model, a well-tested and frequently updated method for measuring tailpipe and burner-tip emissions. The GREET model is utilized by governments, research institutions, businesses, and organizations across the world.

B. The proposed CHS is not "equitable."

The discussion draft calls the CHS a "regulatory option" for reducing GHG emissions from residential, commercial and industrial sources, which is perceived by the agency as required under the Massachusetts Clean Energy and Climate Plan for 2025 and 2030.[13] Despite the fact that a clean heat standard has never been implemented in the Commonwealth or by any other state, local, or territorial government in the United States, MassDEP has somehow determined it to be a "practical and cost-effective policy tool to meet emissions reduction goals for the thermal sector," and further concludes that it can "be implemented in a progressive, equitable manner consistent with the Commonwealth's objectives for a timely and equitable transition."[14] NEFI does not agree with this assertion and believes the CHS, as proposed in the discussion drafts, is neither fair nor equitable.

First and foremost, the proposed CHS will unduly burden low- and moderate-income (LMI) households. Installation of a whole-home heat pump system is prohibitively expensive. An analysis of the 2014-2019 Massachusetts Whole-Home Air-Source Heat Pump Pilot Program found the cost for installing a heat pump system in a home with about 1,500 air-conditioned square feet was often well over $20,000.[15] Adjusted for post-pandemic inflation, increased labor costs, and supply constraints in the HVAC sector, we estimate the total cost could exceed $30,000. Costs continue to rise due to several factors which will take years and decades to resolve. These include the national shortfall of qualified professionals and their long and restrictive licensing requirements.[16] Even taking into consideration available tax credits and public and private rebate programs, homeowners will be saddled with substantial recovery costs of at least five figures, a *significant* cost burden for LMI households. These households are therefore likely to

[13] Massachusetts Department of Environmental Protection (DEP), *Stakeholder Discussion Document: Clean Heat Standard Program Design*, p.1, March 2023.
[14] *Ibid.*
[15] Uglietto, Joe, *Cost of Residential Air Source Heat Pumps*, Diversified Energy Specialists, September 24, 2021.
[16] Ramukar, Amrith, *America is trying to electrify. There aren't enough electricians.*, Wall Street Journal, February 28, 2023. Available at https://www.wsj.com/articles/america-is-trying-to-electrify-there-arent-enough-electricians-4260d05b, accessed April 29, 2023.

continue to utilize fuels and technologies that do not meet the requirements of the CHS, effectively making the program regressive.

Second, the CHS will significantly harm our independent Main Street energy businesses by forcing them to surrender their consumers to large private utilities, some of which are foreign-owned. In addition to compliance with stringent annual emissions reduction requirements, the discussion draft also proposes to force these mostly small family businesses to convert at least 3% of their customers to electric heat each year.[17] Such a requirement constitutes an *egregious and unconstitutional* restraint of trade. This proposal renders our members in the Commonwealth no longer competitive, dramatically impedes interstate commerce, and constitutes a clear violation of both the Dormant and Commerce Clauses of the U.S. Constitution.

C. The proposal will harm regional energy security and reliability.

Forcing all 770,000 homes in the Commonwealth that rely on liquid heating fuel and propane to convert entirely to electric heat pumps will significantly jeopardize regional energy security and reliability. ISO-NE and other utility organizations have repeatedly cautioned that widespread building electrification will result in grid imbalances because policy-driven fossil fuel and nuclear plant retirements are outpacing plans for replacement generation from renewable (e.g., solar and wind) energy sources and demand response.[18] Additionally, as use of electricity increases, so does increased peaking problems of ISO-NE. Favoring electric cold-climate heat pumps not only puts increase peaking burdens on the electric grid, and as temperatures decline below freezing to subzero temperatures, the decreasing efficiency/temperature curve in these systems will create a new spiking peak in electrical demand resulting in increasing consumer costs and undermining grid reliability.

It also exposes our economy to possible attacks by foreign adversaries and terrorists and make our grid particularly exposed during the coldest days of winter. Consider that in 2016, Burlington Electric in Vermont was targeted by a Russian cyberattack operation known as "Grizzly Steppe," exposing both potential vulnerabilities of the region's grid and an interest on the part of U.S. adversaries to attack it.[19]

Furthermore, it is a fact that ASHPs simply do not provide adequate warmth and comfort during the coldest days of winter. In fact, most homes that install electric heat pumps as a whole-home heat source often require the legacy furnace or boiler to be retained as a backup. This is particularly true in states like Massachusetts that regularly experience prolonged cold periods. A backup liquid or gas heating system will be needed to alleviate a potential shortfall of the available low ambient temperature due to inefficiencies

[17] *Stakeholder Discussion Document: Clean Heat Standard Program Design*, p.4.
[18] Willson.
[19] Eilperin, Juliet and Adam Entous,

of the heat pump system.[20] Retaining such systems will ensure families have sufficient heat during the coldest parts of the winter, thereby securing their health and safety. In most cases, our members report homeowners are only interested in minisplit (i.e., ductless) heat pumps to heat smaller spaces, such as a home office or closed-in patio or sundeck.

IV. Conclusion

The discussion draft documents outline a program that prioritizes heat pump installations over greenhouse gas emission reductions. MassDEP will not accomplish its climate goals or successfully decarbonize the Commonwealth's building sector with this proposed "heat pump standard." The net effect of this program will be to ***harm vulnerable households and small businesses***, reduce market competitiveness and consumer choice, destabilize the region's electric grid, and very likely ***worsen climate change***. NEFI strongly urges that MassDEP work with the region's Main Street heating fuel providers to develop and implement common-sense policies that support small businesses while preserving market competition and consumer choice.

NEFI also notes for the record its full endorsement of the comments submitted by its affiliated state association, the Massachusetts Energy Marketers Association (MEMA). We commend NEFI and MEMA members and their hard-working professionals in the Commonwealth for their many decades of service to their customers and communities; and for their continued commitment to delivering safe, reliable, and efficient home comfort products and services for the lowest possible cost and minimal environmental impacts.

Thank you again for the opportunity to provide these comments. I would be happy to answer any questions or provide additional information as requested and can be reached at (202) 508-3645 or via email at sean.cota@nefi.com.

Sincerely,

Sean O. Cota
NEFI President & CEO

[20] Islam, Neehad, et al., *Development of a Best Practices for Integrated Hydronic and Ductless, Air-source Heat Pump Systems*, National Oilheat Research Alliance Research and Education Center, Plainview, NY, May 2021.

Next Grid Markets, LLC
One Broadway, 14th Floor
Cambridge, MA 02142
www.nextgridmarkets.com

Date: May 1, 2023

To: Massachusetts Department of Environmental Protection (MassDEP)

From: Next Grid Markets

Subject: Comments on Clean Heat Standard Program Design

The purpose of this letter is for Next Grid Markets (Next Grid) to provide comments on the Clean Heat Standard (CHS) Program Design being conducted by the Massachusetts Department of Environmental Protection (MassDEP). These comments pertain to the Stakeholder Discussion Document put forth by MassDEP.

Addressing climate change is the preeminent issue of our day and electrification is one of the keys to successfully reducing GHG emissions. Next Grid supports the formation of a Clean Heat Standard and believes it will be an important tool in supporting electrification of the heating sector. Successfully electrifying is enormously complex, however, and we encourage the MassDEP to create the CHS in such a way as to not negatively impact other programs, particularly the APS.

It is in this spirit that these comments are presented to the MassDEP. Next Grid's comments will focus on the questions on page 10 of the Discussion Document, under the Section "Interactions with Other Programs".

BACKGROUND

Next Grid is a Massachusetts-based company focused on developing and optimizing distributed generation assets, predominately in Massachusetts. Next Grid is uniquely qualified to provide comments on the APS due to fact that Next Grid has worked with numerous combined heat and power (CHP), heat pump, energy from waste, and biodiesel clients to successfully qualify, verify and monetize their energy credits, and is the Commonwealth's leading marketer of renewable and alternative energy credits, managing hundreds of thousands of Alternative Energy Portfolio Standard (APS), Renewable Energy Portfolio Standard (RPS), and Clean Peak Standard (CPS) credits per year. Next Grid also holds the MA statewide contract for alternative and renewable energy certificate services with the Division of Capital Asset Management and Maintenance (DCAMM).

Below you will find Next Grid's comments to the questions asked in the Discussion Document.

Next Grid Markets, LLC
One Broadway, 14th Floor
Cambridge, MA 02142
www.nextgridmarkets.com

COMMENTS

On page 9 of the Document, there is a discussion of how the CHS would interact with other programs, particularly the APS. This discussion introduces the idea that the interaction between the CHS and the APS could be similar to the relationship between the CES and the RPS, in which an Obligated Party can meet its CES obligation by procuring a Class 1 REC. This has proved to be beneficial to Class 1 generators by expanding the demand for Class 1 RECs, and preventing what would otherwise be an oversupplied market for Class 1 RECs.

As detailed in the Discussion Document, it envisions a scenario in which each time APS certificates are issued by DOER for blended biofuels, a corresponding amount of marketable CHS compliance credits are automatically issued to the same company by MassDEP. This could make sense for biofuels since biofuels are capped at 20% of the APS and therefore would not, on its own, lead to an over-supply of the market.

This could make sense for heat pumps so long as they are not allowed to "double-dip" in both the CHS and the APS, as that would completely eviscerate the APS by over-supplying the market.

The APS has already been over-supplied in recent years; this is a result of additional technologies being added to the program without a corresponding increase in the requirement (renewable thermal, including heat pumps, in 2014, and fuel cells and energy from waste in 2016). This also corresponded with a significant drop in compliance load, from 50,026,093 MWH in 2010 to 43,624,906 MWH in 2020. This nearly 13% decrease in load, together with additional supply from other technologies, had the impact of significantly softening prices.

If heat pumps were able to qualify for both the CHS and APS (i.e., "double dipping"), they would further lead to an over-supplied market. For example, in Q4 2022 APS generation, which was just released on April 15, 2023, AECs generated from air source and ground source heat pumps increased from 8,602 AECs in Q4 2021 to 114,350 AECs in Q4 2023, or about 5% of the total *annual* APS obligation. Overall, AECs generated from heat pumps increased by more than 450% from 2021 to 2022.

Since a small heat pump application (i.e., a residential installation) can "forward mint" AECs for 10 years, a typical residential application generates about 300 AECs (depending on air source or ground source, as well as the square footage of the house). ***Therefore, as an example, in Q4 2022, the equivalent of only about 380 residential heat pumps installations represented about 5% of the total annual APS obligation.***

The Commonwealth's decarbonization strategy lays out a goal of installing 100,000 heat pumps per year. While we support this goal, it would clearly lead to a massively over-supplied APS market if heat pumps were able to double dip. If the goal is to incentivize heat pump installations, allowing heat pumps to double dip and qualify for both the APS and CHS would not help achieve that objective. It would only lead to an over-supplied APS but would not help to electrify the heating sector, which is the goal of the CHS.

Next Grid Markets, LLC
One Broadway, 14th Floor
Cambridge, MA 02142
www.nextgridmarkets.com

We recommend the CHS further think through the interaction between the two programs as an unintended consequence may be an APS program that is so over-supplied that it becomes effectively worthless, which would not help in the goal of incentivizing heat pump installations. We would recommend structuring the CHS such that participants can either decide which program to be a part of or nest the APS in within the CHS, similar to the relationship between Class 1 RECs and the CES (assuming that the CHS has an ACP similar to the CES).

We applaud the MassDEP for its efforts to create the CHS and thank you for the opportunity to provide these comments. We are available should you have questions or comments on the enclosed.

Best regards,

Matthew Wolfe
Managing Partner, Next Grid Markets, LLC

5/1/23

Ted Noonan from Noonan Energy comments for the MA DEP Clean Heat Standard

On behalf of Noonan Energy, I submit the following comments to the Massachusetts Department of Environmental Protection (DEP) on their **Discussion Draft Regulation** and **Stakeholder Discussion Document Program Design** for a Clean Heat Standard (CHS) for the Commonwealth.
Noonan Energy is a fifth-generation family-owned business that has been serving the home comfort needs of customers in Western Massachusetts since 1890. We provide fuel delivery, HVAC, plumbing and electrical services. We have been involved for many years with the Mass Save program related to home energy efficiency, rebates and in years past, have also participated as a Home Performance Contractor (HPC) in the Mass Save program. We were an early adopter of biofuels and have now successfully blended millions of gallons of biofuels into heating oil to create a more renewable fuel for our customers over the last decade. We currently employ approximately sixty-five employees in various facets of energy distribution, repair, and maintenance. I have participated in numerous discussions at the state level regarding renewable energy advancements, particularly related to the first in the nation biofuel mandate of 2008 which was never implemented for reasons still unknown. Despite that, we have continued to blend biofuels anyway and have been a participant in the APS program for the last number of years. We have numerous issues with the proposed Clean Heat Standard which we would like to outline in our comments below:

- Describing a CHS as a "cost-effective policy tool" (Page 1 of the **Stakeholder Discussion Document Program Design**) is disingenuous. A CHS is nothing more than an escalating tax on liquid fuels to encourage "electrification" and eliminate liquid fuels for the thermal sector. The escalating tax will have a dramatic impact on homeowners and businesses across Massachusetts. Despite DEP's assertion that the "tax" will be paid by the business owners, any educated individual with an understanding of consumerism will know that the cost will be passed on to consumers who will shoulder the burden of the new regulations. This is particularly devastating in an economy where the cost of living has increased dramatically in the past 3 years.

- As to the suggestion that energy companies convert 3% of their customer base to electric heat pumps each year, it is simply collusion. Eliminating well over five hundred businesses in Massachusetts in favor of a few dozen Quasi public monopolies, sometimes foreign owned, is deceitful, manipulative, dangerous and irresponsible for Massachusetts residents. Please understand with complete transparency that this is currently being reviewed by counsel on behalf of the industry.

- There is no clear path to a totally renewable electric grid which would be required to substantiate your suggestion that making this change would prove fruitful. According to ISO New England, in order to keep the system reliable during times of stress, it is predicted that the infrastructure for just reserves would need to increase from 15%-300% by 2040. It is well documented by ISO New England among other analysts and industry researchers, that our current electric grid cannot handle the additional capacity without billions of dollars of investment in the coming years. Once again, the cost of these improvements would come out of the pockets of the consumers in Massachusetts who already pay the 3rd or 4th highest cost of electricity in the country.

- Increasing the cost of doing business in an area or a state creates financial instability. Is our intention to make the cost of manufacturing and doing business in Massachusetts so costly that we lose industry to other states and create a greater financial burden for consumers in the State of Massachusetts, a state with one of the highest costs of living already? Federal guidelines and standards should guide our approach to a clean future, as we all breathe the same air; the businesses that are forced out of our state due to unreasonable regulations and move to surrounding states or countries will conduct their businesses under those standards many of which have far fewer emissions regulations than we do. Lines on a map do not delineate clean air.

- Under the CHS, the reporting of data regarding "obligated parties" must not add any additional burden to small businesses who already take on an undue burden of excessive government regulations and ultimately cost, which again gets passed on to the consumer. Requiring wholesale operators to report gallons to the state would yield erroneous empty data that would only cause confusion. The commonwealth should know from the 2008 biofuel mandate, that the terminal operator has no idea of where the product loaded from their terminal will ultimately get delivered; therefore, reporting would provide the state information that would not only be useless due to its inaccuracies, but probably add more confusion to the process. If a CHS were to be implemented, the only place for reporting would be by the retailer and state officials should talk with leading experts in the industry to develop a plan for the easiest possible process to make this happen. This would also require the state to inform all out of state companies about the requirements and regulations for delivering fuel in MA. How would this be handled and enforced? This again, was a major stumbling block for implementing the 2008 biofuel mandate and continues to remain an obstacle.

- The DEP's statements on page 6 of the **Stakeholder Discussion Document Program Design** regarding limiting credit generation only for "bioenergy that is manufactured from waste feedstocks" continues to be perplexing. How is it that Massachusetts is the only state in the country that continues to ignore the science with regards to advanced biofuels as defined by the EPA which would allow the use of soy as well as other biofuels deemed appropriate to reduce GHG emissions and achieve the goals laid out in the commonwealth's plans? We have renewable energy with regards to advanced biofuels as outlined by the EPA, we are unsure as to why the state is seeing this differently and we have yet to be given an answer on this. Limiting feedstock to only waste feedstock is a misinformed and uneducated approach, as there is and never will be enough of this produced to create biofuel to meet our demand. Expanding the feedstock would open the floodgates of getting more biodiesel into this region of the country. In addition to that, why would the state not utilize the GREET model that has been widely used across the world to achieve a full life cycle analysis of competing fuels? Evidence suggests that the state's reluctance to support any available pathway to reduce GHG emissions instead of trying to pick winners and losers is not only counterproductive but clearly calls into question the motives of the individuals who have promulgated the regulations.

- Significant inequities exist throughout the state's proposal. Clear market prejudice is evident in creating a CHS for oil, propane and natural gas companies while exempting electric utilities. Electric utilities continue to use fossil fuels to create most of the electricity

for the state. The electric utilities are not even close to being able to create true green energy; therefore, they should be held to the same standards for producing clean energy. Again, if we are really trying to do what's right for the commonwealth should not all distributors of energy be required to do so on a level playing field? Are we not just subsidizing electricity with other fuels and giving the electric utilities no reason to increase renewable capacity? It continues to be clear that the state has no idea of when we can expect to achieve fully renewable electric generation and more importantly the cost of doing so. Make no mistake, this program is simply an added tax on consumers which could not be coming at them at a more challenging time from a financial perspective. This plan is ultimately going to impact the consumer in significant and devastating ways. The state is not forthright in laying out a comprehensive plan, including costs, for the consumers. In our industry, our customers come first, and we will be sure that our customers know what the costs will be as part of this plan as soon as that information becomes available.

- With regards to heat pumps, we have been installing them for a long time. They certainly have their place in the energy space but for most homes, they are not the answer for long-term comfort and affordability. Based on the outline of this proposed plan, there has been a significant oversight regarding the longevity, installation & operating costs and environmental footprint of this equipment. On average, heat pumps will need to be replaced twice or three times as often as a traditional renewable liquid fuel system. What is the environmental and economic impact of the manufacturing, transportation, installation, and disposal of these systems that most often come from countries that we do not consider friendly to the United States? It also calls into question lithium along with other materials needed for battery creation and storage which will be an important part of utilizing wind and solar in future years. The mining of minerals such as lithium has a devastating impact on the earth, making it very difficult to see how this proposal is one that has the environment at the center of its agenda. Why is it that many of the environmentalists in the US are not in favor of more lithium mines in our country but it is acceptable to receive these products from countries that do not have anywhere near the environmental safeguards or labor laws that we do in America and again are often not friendly to the United States? So many contradictions here.

- Lastly, the federal government seems to understand the benefits of an all-in energy policy that capitalizes on many different ways to achieve our carbon reduction goals such as the HBIP program that was extended in the IRA. This program is designed to incentivize companies like ours to build infrastructure to promote higher blends of biofuel into petroleum. This would help to promote a free market where consumers have a choice in how to spend their money and it allows them to create hybrid approaches to their energy consumption needs. As a company, we were firmly committed to utilizing the USDA HBIP program to expand the use of biofuels, continuing to do our part in working toward a cleaner energy future. This proposal by the state which disincentivizes the continued use of liquid renewable energy has put a halt to those plans, ultimately stalling us from doing our part in the clean energy work, a bit contradictory to the mission of the DEP. How is it that the State of Massachusetts knows so much better than the federal government on how to achieve our goals? Shouldn't we be working together, state, federal government and businesses, having conversations, sharing challenges and concerns, and developing plans for a future that works toward one common goal for the wellbeing of all?

In closing, it appears the state is again in the position of putting the cart before the horse. If you were serious about achieving the goals that you have outlined, you would be engaging all stakeholders and creating a level playing field and not be trying to pick winners and losers. For us, this is about Choice. Our customers should be able to make a choice that they feel is right for them without being told what to do by the state. With Bioheat, they have a drop in fuel that comes at virtually no additional cost or expensive system modification or replacement. Back in 2008, I sat at Holyoke Community College while the state preached to us about heat pumps being renewable thermal technology (which in and of themselves they are not). Here we are, 15 years later, and there still has not been enough progress to distinguish that claim today given that only a fraction of our electrical generation comes from pure renewable energy resources in times when we need it most. I would be fully in support of electrification as a strategy if we could do so affordably, reliably, and fully renewably, but until then let's make sensible decisions about our energy future. Thank you for the opportunity to submit comments on this straw proposal and I look forward to being engaged on this as we move forward.

comment

O'Rourke, Thomas J <thomas.orourke@eversource.com>

Wed 4/12/2023 3:47 PM

To: Strategies, Climate (DEP) <climate.strategies@mass.gov>

To Whom it may concern,

Please check units for NG, looks like it should be 0.05444 mt/1000 scf, not scf.

Thomas O'Rourke
Eversource Gas Sales
339-987-7022

PAYLESSFOROIL.com
ORDER ONLINE...ANYTIME

95 Main St • South Hadley, Massachusetts 01075

TOLL FREE 855-OIL-4LES

Massachusetts Department of Environmental Protection
100 Cambridge Street
Suite 900
Boston, MA 02114

TO WHOM IT MAY CONCERN

I am Christopher Chase, President of Paylessforoil.com Inc. A Liquid Heating Fuels dealer servicing approximately 9,000 customers throughout Western Massachusetts and North Central Connecticut. I write to you as a stakeholder regarding the proposed Massachusetts Clean Heat Standard. My comments and questions concerning your March 2023 Clean Heat Standard Discussion Document and Heating Fuel Supplier Discussion Draft Regulation are as follows.

When there was first mention of the possibility of a Clean Heat Standard in Massachusetts, I was cautiously optimistic about it. **I do believe** that a fair and **DIVERSE** energy policy can be created that will achieve the carbon goals of the state. **What you have proposed here is neither fair nor good** for anyone involved. It is downright antitrust and will cause you **TO NOT REACH your stated carbon goals.**

IS YOUR GOAL TO REDUCE CARBON EMISSIONS TO NEAR NET ZERO AS SOON AS POSSIBLE OR IS YOUR GOAL SIMPLY TO PUSH A POLITICAL AGENDA AS SOON AS POSSIBLE?

If your goal is to actually reduce carbon emissions from the heating sector in the Commonwealth of Massachusetts, **you NEED to work in coordination with heating fuel dealers INSTEAD** of drafting policies that will ensure their quick demise.

It is very evident that your whole solution to reducing carbon emissions from the heating sector is the installation of air source or ground source heat pumps in every building in the Commonwealth of Massachusetts. You make no secret of this and leave no room for alternatives.

Let's be frank! **It is simply NOT POSSIBLE** to perform the number of heat pump conversions you need to meet your 2050 climate objectives.

Why?

#1 – **Consumers don't want them!** *People like things that actually work.* Heat pumps are great at cooling, great for space heating, and are ok for heating so long as temperatures remain above freezing. However once temperatures get cold... All bets are off! Massachusetts is in the Northeast and still gets darned cold in the winter! I am fairly certain you are all aware of this. **Consumers like to be comfortable!** You are essentially asking (forcing) them to go backwards in time to a less comfortable standard of living.

#2 – **Consumers can't afford them!** You can implement all the tax incentives you want for conversions. But unless you are going to pay the actual consumer bill for a heat pump installation, most consumers simply don't have the money for a heat pump conversion. **Heat pumps are very expensive**, particularly the cold climate heat pumps that would be needed in Massachusetts. I say this as a business that also installs and makes money selling heat pumps (through our sister company). So, I am not totally biased here. We have no problems offering our customers what they want.

#3 – **Who is going to install them?** The Commonwealth has had a 100,000 per year heat pump installation goal for a while now. **You have fallen woefully short of that goal!** By well over 90% each year. Have you asked yourselves why? Besides the other reasons I mention, there simply aren't enough trained HVAC technicians/companies available to meet a 100,000 install per year goal. Not to mention the availability of the heat pumps themselves.

#4 – **Consumers like choice!** Consumers like dealing with their local heating suppliers. They don't particularly like dealing with the utility companies. Both of those statements have been proven true!

YOU SHOULD NOT PUT ALL YOUR EGGS IN ONE BASKET WHEN IT COMES TO LOWERING CARBON EMISSIONS.

Liquid Fuel Dealers such as Paylessforoil.com Inc. has a product available **NOW...** that can be delivered **NOW...** to equipment already in customer homes **NOW...** that will immediately reduce carbon emissions **NOW!** It is called biodiesel (Bioheat) **But you only seem to support this on a limited basis. WHY???**

We (Liquid Fuel Dealers) have the ability to deliver biodiesel in larger blends than ever up to and including delivering a pure b100 renewable fuel. **So long as the product is available! You are clinging to an erroneous theory that only waste feedstock biodiesel should qualify.** This terrible thinking stems from when **you got bamboozled** by certain individuals while creating the Alternative Portfolio Standard. There is only a limited supply of waste biodiesel, and it costs more than most other biodiesel. Just admit you erred with the APS and **OPEN UP ALL BIODIESEL FEEDSTOCKS to be eligible for any current or future carbon lowering**

programs you implement. If a fuel is good enough to create a federal RINS, I don't see how you can exclude it from a state program.

THE ONLY COMPONENT YOU SHOULD BE WORRIED ABOUT IN A CARBON REDUCTION PROGRAM IS... IF IN FACT THE ACTUAL PRODUCT DOES INDEED REDUCE THE CARBON OUTPUT!

Whether the liquid fuel is grease based, soy based or whatever based is irrelevant so long as you are achieving your carbon lowering objectives. **ALL biodiesel does this and does this well!**

In addition to **all** biodiesel, you need to **include other renewable fuels** in this quest for carbon reduction. As an example, fuels such as renewable diesel (renewable heating oil) and renewable propane. While not as readily available right now, the production of those two fuels is projected to skyrocket in a very short period of time. **GIVE THE PRODUCERS AN INCENTIVE TO INCREASE PRODUCTION OF THESE FUELS!** They can all be part of the solution!

YOU NEED TO REVERSE YOUR THINKING!

Instead of trying to make us extinct, you should be helping us to promote our clean fuel! The Liquid Fuel Dealer industry is the **ONLY INDUSTRY** that can **RIGHT NOW** help you to reach your climate goals in the timeframe you suggest.

a) We have low carbon fuels we can deliver now.
b) Our low carbon fuels require our customers to spend little to no money on equipment conversions.
c) Our low carbon fuels are delivered by generational family businesses that allow the consumer to CHOOSE whom they want to do business with.

d) Pure biodiesel is NOT hazardous and is not bad for the environment!
e) Utilizing our fuel does not put unnecessary strain on an electric grid that cannot handle a state full of heat pumps.

In reading your discussion documents, it is clear you have high praise for California's LCFS and the Federal RFS programs. **However, what we can extrapolate from your writings, is a proposed program that is nothing at all like either program!** The LCFS IS NOT biased towards a single solution **NOR** is it structured in a way demanding any one business cut its customer base by 3-7% per year till such business disappears off the face of the planet!

It is my opinion that you have two very different paths you can take.

A) Continue with your misguided theory of trying to force a heat pump upon everyone. Heat pumps that are powered full time by only a single source --- electricity. **Electricity which is produced by burning the dirtiest of fuels! (the heavy oils & gas)** Heat pumps that face all of the challenges I state above!

OR

B) **HELP US TO HELP YOU!** This seems like a better opportunity for everyone! It is better for the environment, the Commonwealth of Massachusetts, the consumer, and the local economy. And helping us to help you doesn't necessarily mean you can't have a CHS. You just need to have one that is fair and equitable **to everyone involved.** One without ridiculous and burdensome reporting requirements for dealers, one that isn't blatantly trying to put them out of business and one that doesn't limit **ALL OF** the quality low carbon heating OPTIONS that are available to the Massachusetts consumer. **Quality options that are available NOW!**

In Conclusion. There are somewhere between 600,000 to 700,000 homes in Massachusetts that are heated with heating oil. This is approximately 25% of all homes in the state. Our own customer base represents about 1% of the total oil heated homes. *I am fairly certain* when I inform my customers of your "oil tax" proposal and your willingness to force them to get their heat from unreliable heat pumps, they are going to have something to say about this. I plan on telling them exactly who to contact.

Respectfully,

Christopher J Chase

President

Paylessforoil.com Inc.
95 Main St
South Hadley MA 01104
855-645-4537

Serving almost 9,000 happy customers who receive a lower carbon Bioheat® fuel

May 1, 2023

Bonnie Heiple, Commissioner
Massachusetts Department of Environmental Protection
100 Cambridge Street, Suite 900
Boston, MA 02114

Submitted via email to climate.strategies@mass.gov

Re: Massachusetts Clean Heat Standard Stakeholder Input

Dear Commissioner Heiple,

The Partnership for Policy Integrity (PFPI) appreciates this opportunity to comment on the proposed Massachusetts Clean Heat Standard (CHS). PFPI has joined in the joint comments submitted by the Conservation Law Foundation, Acadia Center, et al., and we are submitting this separate comment to explicitly state that wood-based heat must not, under any circumstances, be included in a CHS. Wood-burning heating units and combined heat and power (CHP) facilities must be excluded from the CHS program because their greenhouse gas emission impacts are greater than from fossil fuels and they adversely affect local air quality.

Massachusetts has been a leader in recognizing that forest biomass energy increases greenhouse gas emissions and contributes to climate change. Burning wood releases far more carbon into the air than the dirtiest fossil fuels.[1] Lifecycle analyses show that even when wood "residues" are burned (as opposed to trees logged for fuel), wood heating is a net source of carbon emissions in the atmosphere for decades – well past the timeframe for meaningful climate action.[2]

Furthermore, wood-burning boilers and furnaces emit a disproportionately large amount of air pollution in Massachusetts. **According to the most recent EPA emissions data, residential and commercial wood heating accounted for 83% of all fine particulate (PM 2.5) emissions from Massachusetts' heating sector, and 22% of the state's total PM 2.5 emissions.[3]** These figures are all the more alarming given that DOER estimates that fewer than 2% of

[1] Walker, T. *et al*., Manomet Center for Conservation Sciences. *Biomass Sustainability and Carbon Policy Study* (June 2010). Prepared for the Massachusetts Department of Energy Resources, https://www.mass.gov/files/documents/2016/08/qx/manomet-biomass-report-full-hirez.pdf.

[2] Laganiere, J., et al. *Range and Uncertainties*..., Feb 2017 (available https://onlinelibrary.wiley.com/doi/epdf/10.1111/gcbb.12327); Booth, M.S., *Not Carbon Neutral*…, Feb. 2018 (available at https://iopscience.iop.org/article/10.1088/1748-9326/aaac88). These studies refute the claim by Richard Cowart, et al., "A Clean Heat Standard for Massachusetts" (Appendix B of the MA 2025/2030 CECP), which states that "Some sources of woody biomass could be considered to be zero- or low-GHG emitting when evaluated on a life cycle basis."

[3] See https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data.

Massachusetts homes are heated with wood.[4] Many health experts believe that there is no safe level of exposure to PM 2.5 emissions below which negative health effects aren't seen.[5]

For years, the wood heating industry has contended that so-called "advanced wood heating" is clean, efficient, and meets EPA's latest emission standards. However, two recent assessments have shown that these claims are not substantiated. A 2021 report by the Northeast States for Coordinated Air Use Management (NESCAUM) found that "EPA's certification program to ensure new wood heaters meet clean air requirements is dysfunctional."[6] The EPA Office of Inspector General subsequently conducted its own review, published February 28, 2023, which found "The EPA's residential wood heater program puts human health and the environment at risk for exposure to dangerous fine-particulate- matter pollution by allowing sales of wood heaters that may not meet emission standards."[7]

Clearly, wood heating has significant enough disadvantages as a replacement for fossil fuels to warrant categorical exclusion from the Clean Heat Standard. We further recommend that the biomass eligibility provisions in the Alternative Portfolio Standard be eliminated, and not carried over into the CHS.[8] This action would be consistent with the recent amendment of Massachusetts' Renewable Portfolio Standard legislation to remove eligibility for woody biomass energy.

Thank you for your consideration.

Sincerely,

Kathryn R. Eiseman
Policy Advisor
Partnership for Policy Integrity
413-320-0747
keiseman@pfpi.net

[4] See https://www.mass.gov/service-details/how-massachusetts-households-heat-their-homes.

[5] Marks, G, *Misuse of Pollution Reference Standards: No Safe Level of Air Pollution,* American Journal of Respiratory and Critical Care Medicine, May 1, 2022 (available at https://www.atsjournals.org/doi/full/10.1164/rccm.202201-0160ED).

[6] See https://www.nescaum.org/documents/nescaum-review-of-epa-rwh-nsps-certification-program-rev-3-30-21.pdf.

[7] https://www.epa.gov/office-inspector-general/report-epas-residential-wood-heater-program-does-not-provide-reasonable.

[8] Cowart, et al. ("A Clean Heat Standard for Massachusetts) suggest that forest-derived biomass fuels that meet the criteria for the APS should be considered clean; however. current regulations fail to meet the statutory requirements for protecting air quality, reducing emissions, and protecting forests.

PGANE
PROPANE GAS ASSOCIATION
OF NEW ENGLAND

1024 Suncook Valley Hwy, C5
PO Box 1071
Epsom, NH 03234

May 1, 2023

Department of Environmental Protection
100 Cambridge Steet,
Boston, MA 02114

Re: Massachusetts Clean Heat Standard

COMMENTS OF THE PROPANE GAS ASSOCIATION OF NEW ENGLAND

On behalf of the Propane Gas Association of New England (PGANE), which represents propane marketers, suppliers and equipment manufacturers across Massachusetts, we appreciate the opportunity to provide comment regarding the Massachusetts Department of Environmental Protection's (DEP) proposed Clean Heat Standard (CHS) regulation. Our members provide clean-burning and critical energy to residential, commercial, industrial, and agricultural customers across the Bay State.

The Commonwealth of Massachusetts boasts a robust propane market, having nearly 250,000 retail accounts and 92,000 primary home heating customers.[1] Massachusetts' propane industry provides good-paying jobs and generates more than $615 million in economic activity annually.[2]

The proposed CHS regulation would fundamentally alter the marketplace in which our members seek to operate and conduct business. To be clear, we share DEP's desire to reduce greenhouse gas (GHG) emissions and promote a more carbon-friendly energy sector. Sustainable and cost-effective decarbonization is best achieved through a multi-pronged approach that includes clean and efficient energy molecules, such as propane, in addition to bulk electricity generated from more cleaner sources. Such an approach would take into consideration the reliability and resilience of various energy options, as well as the aggregate costs passed along to energy consumers and commercial businesses.

I. Heating Oil Conversions

The proposed CHS program design states that "the installation of new fossil fuel equipment and services should not be supported the CHS."[3] This restriction would be short-sighted and fails to recognize the distinct differences between traditional energy sources. Propane burns cleanly, efficiently and has a low-

[1] *Propane's Impact on Economy: 2018 Massachusetts,* National Propane Gas Association, https://www.npga.org/wp-content/uploads/2020/06/Massachusetts_Propane-1-Pager_2020.pdf

[2] *Id.*

[3] *MassDEP Stakeholder Discussion Document, Clean Heat Standard Program Design*, Massachusetts Department of Environmental Protection, (March 2013), https://www.mass.gov/doc/clean-heat-standard-discussion-document/download

carbon content.[4] It is nontoxic and will instantly vaporize when released from a pressurized cylinder. Unlike other energy sources, it presents no threat to soil, surface water or ground water.[5] This protects Massachusetts' critical land and water resources. As a less carbon-intensive fuel, the state could achieve immediate GHG reductions in the thermal sector if more consumers simply replaced their antiquated fuel oil heating systems with efficient propane equipment. The carbon reduction opportunities are real and substantial. More than 662,000 households use fuel oil or kerosene to meet their primary space heating needs.[6] And space heating, by far, accounts for the largest share of energy use in a typical household.[7] Encouraging and incentivizing fuel oil or kerosene to propane conversions lowers carbon emissions and provides a faster path to zero.

A. Wood Heat

While DEP alludes to this point in the discussion document,[8] it is important to emphasize that any potential credit generating source should not only be evaluated on its GHG profile, but also its impact on air quality and the broader environment. For example, wood smoke contains high levels of particulate matter that can negatively affect our respiratory and cardiovascular systems and degrades local air quality.[9] And regarding the broader environment, allowing wood stoves to generate credits would incentivize tree felling activities, which would result in a reduction in woody habitat for plants, animals and has other ecological impacts as well. Of course, trees are also natural carbon sinks.

II. Renewable Propane

The CHS standard's focus on fuel-switching to electricity is premised, in part, on the assumption that the bulk electric sector will become greener and more carbon-friendly over time. However, this same assumption is not used to evaluate our industry.

Renewable propane is a by-product of renewable liquid fuels such as sustainable aviation fuel, and can be derived from a variety of sustainable sources, such as biomass, animal fats and vegetable oils.[10] In addition to retaining all of the same environmentally friendly attributes as traditional propane, it has an

[4] *Carbon Dioxide Emissions Coefficients by Fuel*, U.S. Energy Information Administration, (Oct 5, 2022), https://www.eia.gov/environment/emissions/co2_vol_mass.php

[5] *Propane Fuel Basics*, U.S. Department of Energy, https://afdc.energy.gov/fuels/propane_basics.html

[6] *House Heating Fuel 2021: ACS 5-Year Estimates Detailed Tables*, American Community Survey, U.S. Census Bureau (2021), https://data.census.gov/table?q=home+heating+fuel&g=040XX00US25&tid=ACSDT5Y2021.B25040

[7] *Space heating and water hearting account for nearly two thirds of U.S. home energy use*, U.S. Energy Information Administration, (November 7, 2018), https://www.eia.gov/todayinenergy/detail.php?id=37433

[8] *Supra 3.*

[9] *Wood Heating: Health and Environment*, Vermont Department of Environmental Conservation, https://dec.vermont.gov/air-quality/compliance/owb/health-and-environment

[10] *Propane Production and Distribution*, U.S. Department of Energy, https://afdc.energy.gov/fuels/propane_production.html

even lower carbon intensity (CI).[11] In California, renewable propane being used as a vehicle fuel has a carbon intensity score as low as 20.5, far less than other energy sources.[12] Renewable propane is chemically identical to our conventional molecule and can be used as a drop-in replacement in combustion applications.

Recently, the Massachusetts Institute of Technology highlighted research detailing how propane can be produced from waste plastics (e.g., bottles, packaging material) via a new, efficient chemical process.[13] This means propane can help further reduce GHG emissions associated with material production, disposal and waste management. This new production process would further cement propane's place in the circular economy. Clean and renewable energy like propane accelerates the march towards decarbonization, not slows it.

III. Electricity

Bay Staters have long relied on propane for space and water heating, fireplaces, cooking and clothes drying. And the direct use of propane is clean and efficient way to consume energy. It is important to remember that electricity, unlike propane, is a secondary energy source that must first be created. Grid electricity is extremely inefficient and energy is lost during each step of the production and delivery process. For example, 77 percent of our in-state generation for bulk electricity comes from burning fossil fuels, including natural gas and petroleum.[14] The efficiency of a typical natural gas plant, however, is only 44 percent; the efficiency of a petroleum-fired power plant is a paltry 30 percent.[15] Following power generation, additional energy is lost during the transmission and distribution of that electricity to an outlet for an end-use purpose.[16] These inherent inefficiencies mean that more GHGs, as well as air pollutants, are released.

For context, the federal government's Energy Star Program gives propane a source-site ratio of 1.01, compared to 2.80 for electricity from the grid.[17] This means is takes 2.80 units of electricity to produce and deliver one unit of energy to a home, compared to only 1.01 for propane. As such, it should be no

---

[11] *Staff Summary, Renewable Naphtha and Renewable Propane from Distillers' Corn Oil, Used Cooking Oil, and Rendered Animal Fat*, California Air Resources Board (April 30, 2021), https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/fuelpathways/comments/tier2/b0189_summary.pdf

[12] *Id*.

[13] *New Process Could Enable More Efficient Plastics Recycling*, David Chandler, MIT News, (October 6, 2022), https://news.mit.edu/2022/plastics-recycling-cobalt-catalyst-1006

[14] *Electricity Data Browser: 2021 Annual Massachusetts*, U.S. Energy Information Administration, (2021), https://www.eia.gov/electricity/data/browser/#/topic/0?agg=2,0,1&fuel=vtvv&geo=002000000002&sec=008&freq=A&start=2021&end=2022&ctype=linechart&ltype=pin&rtype=s&maptype=0&rse=0&pin=

[15] *Table 8.1. Average Operating Heat Rate for Selected Energy Sources*, U.S. Energy Information Administration, https://www.eia.gov/electricity/annual/html/epa_08_01.html

[16] *Frequently Asked Questions*, U.S. Energy Information Administration, https://www.eia.gov/tools/faqs/faq.php?id=105&t=3

[17] *Energy Star Portfolio Manager, Technical Reference*, U.S. Environmental Protection Agency (October 2020), https://portfoliomanager.energystar.gov/pdf/reference/Source%20Energy.pdf

surprise that conventional propane has a CI score of 77 in Massachusetts,[18] far lower than the commonwealth's CI score for electricity. Utilizing a full fuel-cycle analysis, it is clear that the direct use of propane is a clean and climate friendly way to consume energy.

Finally, our industry continues to deploy cleaner and more efficient products, including tankless water heaters that use considerably less energy than traditional storage units, and micro cogeneration systems that produce electricity and useful thermal energy simultaneously to achieve maximum efficiency.

A. Heat Pumps

DEP's discussion draft makes clear that electric heat pumps installation will be a creditable action in the credit generation marketplace. However, the performance of air-source heat pumps degrades in cold weather and they begin to lose efficiency around 32 degrees.[19] In a cold climate, such as ours, they will require a supplemental heating system to provide adequate warmth and comfort throughout the heating season. With this in mind, efficient propane systems that are installed to provide supplemental building heating to a structure that also utilizes a heat pump should be a credit generating action. Under no circumstance should the installation of inefficient electric resistance heating, even as a backup source, generate CHS credits. These systems put a large burden on the electric grid and are not an adequate means to reduce emissions.

IV. Energy Security

The framework for any clean heating standard must be structured in a way that it does not diminish the reliability, resilience or security of the overall energy sector. Focusing on a single, secondary energy source to reduce carbon emission from residential and commercial buildings would fail this test.

American propane production is at record levels.[20] As a result, clean and reliable domestic energy is readily available to consumers. Propane can easily and economically by transported multiple ways, including by pipeline, rail, ship and over-the-road vehicles. Electricity generated at power plants, in contrast, has only one transportation option: electric utility lines. Unfortunately, power outages are become more prevalent. Across the U.S., the average duration of total power interruptions roughly doubled between 2013-2020.[21]

---

[18] *Understanding Carbon Intensity – New England*, Propane Education and Research Council, (2022), https://propane.com/resource-catalog/resources/understanding-carbon-intensity-new-england/

[19] *Glossary: heat pump (air source)*, U.S. Energy Information Administration, https://www.eia.gov/tools/glossary/index.php?id=H

[20] *U.S. Field Production of Propane*, U.S. Energy Information Administration, (March 31, 2023), https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=M_EPLLPA_FPF_NUS_MBBL&f=M

[21] *U.S. electricity customers experienced eight hours of power interruptions in 2020*, U.S. Energy Information Administration, (November 10, 2021), https://www.eia.gov/todayinenergy/detail.php?id=50316

And closer to home, when you include major event days, in 2021, Massachusetts had the highest System Average Interruption Duration Index (SAIDI) of any state in New England.[22] SAIDI details how many minutes the average utility customer, who is connected to the bulk electric grid, lost power for over the course of a year. An underappreciated fact about propane is that it reduces stress on the electric grid and helps it cope with peak demand. These are the real-world circumstances under which the CHS framework must be evaluated.

V. Responses to Questions

Responses to some of the questions asked in the MassDEP Stakeholder Discussion Document can be found on Page 6 of this letter.

VI. Conclusion

As DEP continues to design the regulatory framework for the CHS, we encourage you to consider our input and create a structure within which efficient propane systems, including systems used to supplement heat pumps, can play a role in advancing Massachusetts' climate goals in a realistic and cost-effective manner.

Thank you again for the opportunity to provide comment.

Respectfully submitted,

Jim Blake
Immediate Past Chairman
Propane Gas Association of New England
9 Hemlock Street
Danvers, MA 01923
jblake@eastern.com

Leslie Anderson
President and CEO
Propane Gas Association of New England
1024 Suncook Valley Highway, Unit C-5
Epsom, NH 03234-1071
leslie@pgane.org
Telephone: 888-445-1075

[22] *Table 11.2 Reliability Metrics Using IEEE of U.S. Distribution System by State, 2021 and 2020*, U.S. Energy Information Administration, https://www.eia.gov/electricity/annual/html/epa_11_02.html

Responses to Questions in Major Topic Areas:

Topic # 1—Setting the Standard

The proposed clean heat standard has targeted fuels utilized at the building site as the primary source of emissions, without regard to electricity and the emissions related to its generation, transmission, and distribution. This is not only inaccurate; it is an injustice to the fuel industries and the citizens of Massachusetts. Electricity in Massachusetts is generated primarily by burning natural gas, which comprises 78% of the energy mix.[23] This translates into a carbon emissions factor of 1.6 times the amount of carbon emitted from propane appliances that deliver the same amount of energy.[24]

The cost to completely upgrade US electrical infrastructure has been estimated to be anywhere from $1 trillion (Reuters[25]) to $7 trillion (Oilprice.com[26]). Certainly, Massachusetts citizens will be responsible for bearing a portion of this burden and the fruits of this labor will not even be realized for several years. In the meantime, much headway can be made in reducing carbon emissions and the financial burden on the citizens of Massachusetts by not imposing the counterproductive measures being considered. Alternative methods might utilize proven systems such as a LCFS (Low Carbon Fuel Standard) provide a path and have proven success in transitioning to Net Zero.

The Climate Commission recognized the GREET model in its recommendations and we encourage DEEP to consider a lifecycle analysis approach in their measurements.

Topic # 2—Regulated Heating Energy Suppliers

For the reasons outlined above and in recognition that the path to net zero carbon emissions is not a step function, it is necessary to impose clean heat standards on the entire energy infrastructure, not just companies that sell fuel and the citizens who consume it on site. Over time, the electricity generation fuel mix will change and become cleaner, but it is critical that the Massachusetts DOER recognize the important contributions that both fossil fuels and fuels made from renewable resources can provide. In the meantime, Massachusetts must acknowledge that the current fuel mix for generating electricity is not optimal for the reduction of carbon emissions and that propane and other fuels provide better performance per unit of energy consumed. To have a true path to zero it is essential to include electric power generation. If the power generation carbon intensity is not reduced the emissions will be reduced on a site basis but increased on the generation side.

Topic # 3—Credit Generation

---

[23] *Source Energy and Emissions Analysis Tool*, GTI Energy, https://cmicseeatcalc.gti.energy/

[24] *Id*.

[25] *Creaky U.S. power grid threatens progress on renewables, EVs*, McLaughlin, T., Reuters, (May 12, 2022), https://www.reuters.com/investigates/special-report/usa-renewables-electric-grid/

[26] *The $7 Trillion Cost Of Upgrading The U.S. Power Grid*, Hyman, L. and Tilles, W., Oilprice.com, (2021),

https://oilprice.com/Energy/Energy-General/The-7-Trillion-Cost-Of-Upgrading-The-US-Power-Grid.html .

Massachusetts citizens and businesses reside in Climate Zone 5, which will provide many days and nights where temperatures drop below freezing, sometimes by tens of degrees. The statement that "electric heat pumps must be creditable" cannot pass without being challenged. All heat pumps are not the same, and air-to-air heat pumps do not perform well when temperatures are in the low 30's (F) and below. In these cases, the only solution is to provide supplemental heat and if reliance is made on electric resistance heat, residents and businesses will be saddled with the burden of high energy costs, as well as the additional carbon emissions that will be realized due to the fuel mix currently feeding the electric grid, as referred to in Topic #1.

If the end game is to achieve close to net zero carbon emissions from the electric grid, then the performance of the grid in its current state should be the benchmark by which all other energy sources are evaluated. Any fuel source or alternate energy source that performs better than the electric grid with respect to carbon emissions calculated on a full fuel cycle basis, should be eligible for the allowable energy credits being developed by Massachusetts. This would require that the fuel mix used for electricity generation be determined regularly to set the new benchmark for the coming year.

Taking this pathway would allow for the gradual upgrading of the clean heat standard and a more orderly transition to both a cleaner electric grid and renewable fuel sources with reduced carbon intensities used on site.

Respectfully submitted,

Jim Blake
Vice Chairman
Propane Gas Association of New England
9 Hemlock Street
Danvers, MA 01923
jblake@eastern.com

Leslie Anderson
President and CEO
Propane Gas Association of New England
1024 Suncook Valley Highway, Unit C-5
Epsom, NH 03234-1071
leslie@pgane.org
Telephone: 888-445-1075

PowerOptions
Powering Nonprofits

Via Electronic Mail

May 1, 2023

Commissioner Bonnie Heiple
Massachusetts Department of Environmental Protection
1 Winter Street
Boston, MA 02108

Re: PowerOptions comments: Massachusetts Clean Heat Standard

Dear Commissioner Heiple,

PowerOptions appreciate the opportunity to provide comments to inform the development of a proposed Clean Heat Standard ("CHS") regulation. PowerOptions represents more than 400 members in Massachusetts, all nonprofit and public entities, including community and human service agencies, housing authorities, municipalities, as well as hospitals and healthcare systems, colleges and universities with more than 7Million dekatherms of natural gas load and more than 1M MWhrs of electric load. Serving many of our members with energy efficiency, electrification, and decarbonization services broadly, we applaud the Massachusetts Commission on Clean Heat's efforts on a CHS to help achieve the Commonwealth's Clean Energy and Climate Plan for 2025 and 2030. We support the implementation of a CHS, but with the costs that will be incurred by customers of all sizes, and in particular those located in and serving Environmental Justice communities like several of our Members, it is important to ensure any new standard is developed ensuring adequate equity protections and consideration of costs to consumers. We offer our comments with this in mind.

We fully support the comments of the Green Energy Consumers Alliance (GECA) and others offered regarding issues of proper consideration for equity. In particular, the direct and indirect burdens and benefits of a potential CHS on low and moderate income customers and black and brown communities must be fully considered by DEP at this state of CHS program design as detailed by GECA et.al in their comment letter. This includes a managed transition away from natural gas in a fair and equitable manner as well.

We also urge DEP to consider a program design that includes implementation of a CHS for natural gas at the utility distribution level versus at the natural gas supply level. This will allow for a single point of collection across a minimal number of entities, providing efficiencies and subsequent reduced costs to consumers. In addition, at this time there is no viable, economic fuel alternative to natural gas for competitive suppliers to be able to meet a clean energy standard, while gas utilities can implement weatherization and electrification as pathways to potential compliance with a measurement based on reduced Greenhous Gas Emissions.

Thank you for the opportunity to provide our comments, we thank you for your consideration. We look forward to working with you further as DEP moves forward with the development of the CHS.

Sincerely,

Heather Takle
President & CEO

MassDEP Clean Heat Standard

Technical notes and comments prepared by Raymond J. Albrecht PE

May 1, 2023

Summary Biography for Raymond J. Albrecht PE

Consulting environmental engineer with over 40 years of experience in the subject area of renewable heating technologies. Technical specialties have included electric and thermally-driven heat pumps, solid and liquid renewable fuels in thermal applications, and power generation. Have performed work for manufacturing companies, trade organizations and environmental agencies relating to equipment design, fuel utilization, regulatory permitting, emissions testing, and life-cycle analysis. Member of the ISO New England Planning Advisory Committee and active with the ISO New England Load Forecasting Committee. Spent 30 years as lead technical staff person for heating technology and fuels R&D at the New York State Energy Research and Development Authority (NYSERDA). NYSERDA work also included field testing of first ground-source heat pump installation in northeastern United States back in early 1980s. Principal of Raymond J. Albrecht LLC for the past 14 years.

Graduate of Cornell University with a Bachelor of Science degree in engineering and a Master of Science degree in Theoretical and Applied Mechanics. Life Member of the American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) and past chairman of ASHRAE Technical Committee 6.10 for Fuels and Combustion. Received the ASHRAE Distinguished Service Award in 2015. Licensed professional engineer (No. 056935) in New York. Served as a 1st Lt (Infantry) in the United States Army during 1970-80 (active plus reserve) and am a graduate of the US Army Infantry Officer School at Fort Benning, Georgia. Fulfilled my active reserve obligation in northeastern Kenya, near the Somali border.

SUMMARY OF COMMENTS

1) MassDEP and MADOER energy policymakers need to incorporate rigorous life-cycle analysis of natural gas for power generation in their analysis of energy resource options for buildings. There would be considerable value in joining the international environmental community and performing unbiased, comprehensive evaluations of the benefits of renewable energy. The Argonne National Laboratory GREET model and UN Intergovernmental Panel on Climate Change (IPCC) guidelines have recognized the need to apply life-cycle analysis to **ALL** energy resources, including electricity.

   Accounting for both CO2 and methane emissions during production and high-pressure transmission of natural gas used for power generation, the resulting total carbon intensity increases approximately 30% above onsite-based values, with a significant downward impact on the calculated level of carbon savings achieved by electrification technologies. The consequences of rigorous life-cycle analysis may be inconvenient to electrification advocates but serve to establish a more honest foundation for energy policy development.

2) There is increasing urgency for reducing the carbon footprint of space heating in residential and commercial buildings. While MassDEP and MADOER staff are to be commended for their

accomplishments in the development of wind and solar generation resources in Massachusetts, the planned pace of renewable energy development in the state is too slow to meet the additional grid loads that would be incurred by full implementation of heat pumps for space heating. Required grid capacities would double, due to an additional 15000 MW peak load for residential and commercial heat pumps, even with the installation of massive quantities of battery storage, and ambitious weatherization efforts to reduce building envelope losses. Massachusetts should follow a dual pathway, to include increased use of renewable fuels such as biodiesel, in accomplishing its carbon savings goals in residential and commercial buildings.

3) MassDEP and MADOER energy policymakers need to use marginal emission rates, rather than average grid mix figures, when evaluating the impact of electrification policies on grid performance. An informative article by the WattTime subsidiary of the Rocky Mountain Institute, explaining the merits of marginal emission rate analysis, is attached as an appendix to this document. Marginal emission rates more accurately account for cause-and-effect changes, including the increased use of fossil generation when intentional grid load increases, due to electrification, outpace the growth of renewable power generation capacity. The use of average grid mix figures will most often seriously underestimate the environmental cost of increased grid loads, will silently ascribe higher carbon intensities to non-thermal electricity uses, and can also lead to double counting of the benefits of renewable power generation.

4) Reducing carbon emissions now is more valuable than reducing the same amount of emissions later. This is because earlier reductions limit the long-term climate impact caused by the accumulation of greenhouse gases. This significant and often overlooked principle is frequently absent from policy discussions, which, for example treat a reduction of CO_2 in 2023 with the same weight as a reduction in 2050. This is simply not accurate and skews the market to seek low-readiness technology options which may not be deployed for years or decades, if ever at all.

   Recently, The State University of New York (SUNY-ESF) published research to highlighting the value of early GHG reduction, which can limit the cumulative heating impact of carbon emissions. This study compared the cumulative emissions reductions and associated societal value of using biodiesel today compared to waiting for a future, potentially lower carbon solution to be deployed later. These results demonstrated that when a technology with a low life-cycle GHG emission profile was deployed even five years later, it would generate less reduction in GHG emissions than a low life-cycle GHG technology deployed sooner. More simply, carbon reductions now are more important than carbon reductions later. The benefits accumulate, much like compound interest on a savings account.

5) Carbon savings achieved by heat pumps during the next few decades will be limited to those which are achievable with natural gas-fired generation, until existing grid loads are fully met by renewable power generation, and further renewable capacity can then be dedicated to heat pump operation. There will thus be a significant time delay in the achievement of fully renewable electrification of thermal applications, which in turn impedes the accomplishment of our environmental goals, especially within the shorter timeframes that are becoming necessary to avoid catastrophic climate change.

6) A recent study by Trinity Consultants (https://www.biodiesel.org/docs/default-source/trinity-study/trinity-v2-final-report-.pdf?sfvrsn=5d3a35c3_15) conducted on 15 high-risk air quality communities, including Boston, found that switching to biodiesel results in substantial health

benefits. Specifically, the benefits include decreased cancer risk, fewer premature deaths, reduced asthma attacks and fewer lost workdays. B100 can achieve these benefits by reducing pollution in applications among the hardest to decarbonize – heavy-duty transportation and residential heating.

7) When marginal emission rates and life-cycle analysis are used properly in the analysis of renewable thermal energy options, the findings include the conclusions that B50 biodiesel blends will generally achieve the same carbon savings as next generation, cold-climate heat pumps, which achieve 25% higher COP values than existing heat pump technology, when using the existing grid. Further, B100 biodiesel fuel will achieve lower carbon intensity than heat pumps until at least 10,000 MW nameplate capacity of wind and solar has become operational in Massachusetts, above and beyond the renewable generation capacity that would be necessary to serve existing grid loads. Biodiesel offers a highly effective, parallel pathway for achieving deep carbon savings and a sustainable energy future.

8) The analysis described in this document has illustrated data showing a wide variation in carbon intensity for electricity throughout the heating season. There is general recognition that increased carbon intensity values occur during cold weather, due to higher grid system loads with operation of lower efficiency generation units. But higher carbon intensities also occur during morning and evening peak periods, due to efficiency penalties of turbine startup and ramping of power output to meet rapid swings in grid load. Variations of grid carbon intensity by a factor of two or more can frequently occur at the same outdoor temperature, due to short duration, peak grid loads. This then leads to the need for web-enabled heat pump control systems that favor the synchronization of operation to periods of low, grid carbon intensity. MassDEP and MADOER Energy policymakers need to recognize that we need to avoid heat pump operation during periods of high grid carbon intensity, when little or no carbon savings are achieved compared to traditional fossil fuel, and yet, substantial wholesale power cost increases occur for grid operation.

9) Recent field-testing studies in New England have revealed a problem of heat pump underutilization by homeowners during the winter. Many homeowners are apparently purchasing heat pumps for primarily air-conditioning purposes, since state and utility incentives typically make the net cost of a heat pump cheaper than air conditioning-only models. MassDEP and MADOER need to establish a comprehensive monitoring and evaluation program for MA heat pump programs to rigorously evaluate heat pump utilization patterns, which will impact the economic and environmental benefits of incentive programs. MassDEP and MADOER energy policymakers need to have a brutally honest discussion regarding whether heat pump incentives should be funded through utility shareholder funds rather than tax or rate-base dollars.

10) MassDEP and MADOER should develop an integrated, year-by-year master plan for side-by-side implementation of heat pumps and thermally-purposed, renewable power generation in Massachusetts. The plan should include hourly analyses, for each successive year, of expected heat pump-based grid loads and the renewable power generation that becomes available, on a dedicated basis, to drive the heat pumps. The objective of the plan should be to forecast, with high temporal resolution, whether the state will make progress toward its environmental goals, or if fossil fuel-fired generation will instead remain the primary power resource for thermally-driven grid loads.

11) MassDEP and MADOER should evaluate the capital expenses that would be necessary for expansion of generation, transmission and distribution capacity of renewable electricity for residential and commercial heat pumps. While a moderate, initial increase in electricity consumption can be served by existing transmission and distribution infrastructure in Massachusetts, the cost of a multi-fold expansion in grid loads will present an enormous economic challenge.

12) Any Alternate Compliance Payments (ACPs) required under the Clean Heat Standard should be recycled back to ALL renewable thermal resource technologies, based on economic and environmental merit, rather than exclusively to just those options which serve to increase electricity sales.

13) Any pre-minting of renewable energy certificates under the Clean Heat Standard should be based on rigorous life-cycle analysis and carbon scoring of heat pump options. Such pre-minting should be based on projected marginal emission rates for power generation during the following ten years, and should be limited to what progress, if any, would be realistically expected re: installation of wind and solar PV power generation capacity that is dedicated to thermal applications, thus above and beyond what would be necessary to meet the needs of the currently existing grid load profile. The recommended ten year period would also reflect a realistic limit on service life of heat pump outdoor units that results from overspeeding of compressors during peak load conditions.

14) No artificial multipliers should be applied to any heating technology incentives under the Clean Heat Standard. All incentives should be based on just the facts.

15) MassDEP and MADOER should become fluent in the EPA AVERT computer model, which now includes direct access to the EPA SMOKE and COBRA models for evaluating the air quality and public health impacts of changes in generation emissions at local power plants in environmental justice (EJ) and Low and Moderate Income (LMI) neighborhoods. The AVERT model can forecast increases in emissions due to higher grid loads that result from electrification and thus help to dispel the false promise that electrification would yield health benefits to EJ/LMI residents.

16) The suggested limitation against the use of crop-based feedstocks for renewable fuel production is an egregious violation of science-based policymaking. The production of biodiesel and renewable diesel will use oil that is a co-product of, and not a competitor to, food production. MassDEP and MADOER energy policymakers mistakenly confuse the FOOD AND FUEL characteristic of biodiesel with the FOOD VS. FUEL aspect of ethanol production. Also, while much of the discussion about feedstock availability centers on domestic US markets, there is growing potential for the development of renewable fuel feedstock production globally, especially by 3rd world farmers, who could achieve greater prosperity by growing energy crops, especially those which are salt- and drought-tolerant, instead of unreliable food crops. After having personally witnessed extreme hunger and poverty during my service many years ago in northeastern Kenya, it became clear that the production of energy crops could provide the economic basis for better nutrition, health care and education. The United Nations Development Programme has achieved considerable progress in this direction with multiple demonstration and commercialization projects. Feedstock limitation policies, such as proposed

by MassDEP and MADOER, would instead condemn the 3rd world farmer to continuing hunger and poverty.

17) A fundamental challenge is that the approximately 5,000 MW nameplate capacity of offshore wind proposed by the Vineyard/Revolution/Deepwater/Mayflower offshore wind projects would only eliminate the need for fossil-based power generation to meet our present grid loads on a handful of days during the year. Any incremental loads such as heat pumps and electric vehicles over the next ten years will simply continue to increase fossil generation loads and push back the day when renewable power generation reaches the margin of electric supply.

    The offshore wind projects planned for the Martha's Vineyard coastal area are jockeying for limited availability of transmission interconnection at the West Barnstable substation, Canal Electric Station and just a few other prospective grid injection points. Recent ISO New England Planning Advisory Committee deliberations have been consumed by technical challenges, including voltage/frequency stability problems, to integrating offshore wind into the southeast Massachusetts grid.

    Even if transmission limitations are resolved, the wind projects planned for the next 10 years, even if fully developed, will be insufficient to eliminate fossil generation, except during a very few hours. Thus, again, any intentional grid load additions for heat pumps or electric vehicles will have to be met with fossil generation.

    The result will be that most heat pumps installed today, if fully utilized for heating thus dealing with a service life of just 10 years or so, will not achieve a single molecule of CO2 reduction compared to B50.

18) The doubling of grid loads to accommodate heat pumps will cause significant upward pressure on the cost of wholesale power. Market clearing prices for wholesale power in the ISO New England control region are set by the last generation plant to clear hourly Day Ahead or Real-time auctions, with the last plant, by definition, having the highest bid price. The corresponding wholesale power rate in $/MWh, attributed to the generation plant at the margin, is then paid to all operating generators within the control region. This means that the total cost of power to customers is set by the most expensive generators to clear the auctions, which means higher electricity costs for everybody when the New England grid is burdened with heat pump loads.

19) Most thermal loads occur during either morning/evening peak periods or during cold weather when peaking operation becomes dominant for power generation at the margin. Under peak load conditions, the direct combustion of biodiesel blends can achieve lower levels of NOx emissions than peaking generators. Additionally, the low-level area source of NOx associated with the direct combustion of biodiesel blends, if heat pumps were to be used, would then be concentrated into a major point source that falls under US EPA Title 5 Clean Air Act emissions standards. Possible environmental justice concerns would result due to high local emissions in low-income neighborhoods adjacent to power plants.

INTRODUCTORY COMMENTS

EXPANDING THE AVAILABILITY OF BIODIESEL GENERATES LONG-TERM CLIMATE BENEFITS

As stated in the stark UN IPCC 6th assessment released on August 12th, 2021, "It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred." Furthermore, the report states, "From a physical science perspective, limiting human-induced global warming to a specific level requires limiting cumulative CO2 emissions, reaching at least net zero CO2 emissions, along with strong reductions in other greenhouse gas emissions."

Simply put, reducing carbon emissions now is more valuable than reducing the same amount of emissions later. This is because earlier reductions limit the long-term climate impact caused by the accumulation of greenhouse gases. This significant and often overlooked principle is frequently absent from policy discussions, which, for example treat a reduction of CO_2 in 2023 with the same weight as a reduction in 2050. This is simply not accurate and skews the market to seek low-readiness technology options which may not be deployed for years or decades, if ever at all.

Recently, The State University of New York (SUNY-ESF) published research to highlighting the value of early GHG reduction, limiting the cumulative heating impact of carbon emissions. This study compared the cumulative emissions reductions and associated societal value of using biodiesel today compared to waiting for a future, potentially lower carbon solution to be deployed later. These results demonstrated that when a technology with a low life-cycle GHG emission profile was deployed even five years later, it would generate less reduction in GHG emissions than a low life-cycle GHG technology deployed sooner. More simply, carbon reductions now are more important than carbon reductions later. The benefits accumulate, much like compound interest on a savings account.

While the current study was focused on transportation, it is likely to be expanded to cover home heating, including the use of biodiesel, electric heat pumps and natural gas. This work, which considered the timing of carbon reductions from a financial and economic standpoint has been echoed from a physical sciences standpoint in different journals by other researchers at UC Davis who have studied what they call, the 'Time Adjusted Warming Potential'.

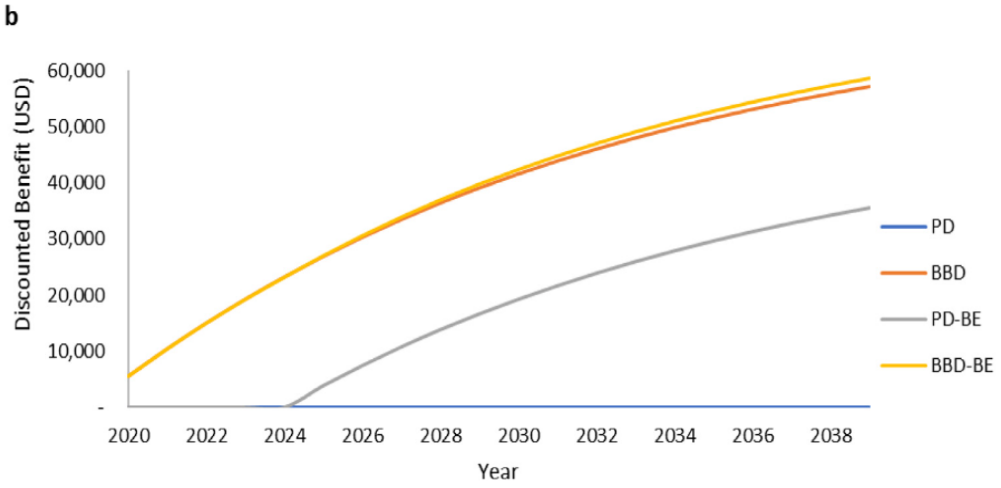


Figure 1. Time-based Sensitivity of Cumulative CO2 Savings for Biodiesel (orange) vs. Electrification Technologies (gray)

HEALTH BENEFITS OF BIODIESEL - BEYOND GREENHOUSE GAS SAVINGS

The increased use of biodiesel in home heating oil applications not only has significant GHG benefits as noted by researchers across the nation but replacing diesel with biodiesel also results in a dramatic reduction in co-pollutants, sometimes called criteria pollution or tailpipe emissions. In particular, biodiesel can reduce diesel particulate matter emissions in home heating oil applications by 86%. These dramatic reductions can lead to significant health benefits in the form of reduced asthma attacks, avoided work loss days, and reduced cancer risk.

Often, the modeling framework to assess the health benefits from a reduction in criteria pollution employs a top-down method, estimating a reduction in specific criteria pollutant like PM, and assuming there is a normal distribution of these benefits among citizens. While this is appropriate to generally characterize the benefits of a policy designed to reduce these harmful emissions, it often fails to help decision makers and citizens truly understand how the reduction in these emissions will affect their local community and in what way.

To better characterize the health benefits biodiesel can generate in local communities who switch from diesel, Clean Fuels Alliance America commissioned a study (https://www.biodiesel.org/docs/default-source/trinity-study/trinity-v2-final-report-.pdf?sfvrsn=5d3a35c3_15) by Trinity Consultants, a globally renowned air quality modeling firm, who specializes in air dispersion modeling. Their work, which is published online, characterizes the benefits of these fuels much more granularly, allowing decision makers to understand where the benefits of reduced particulate matter, improved health outcomes, would occur and to whom. The results demonstrate that the use of B100 as a heating oil replacement reduces carcinogenic, diesel particulate matter emissions by 86%.

REFERENCES USED IN PREPARATION OF TECHNICAL NOTES AND COMMENTS

As the first step in preparation of these technical notes and comments, I compiled and reviewed several key testing reports that have been published over the past six years relating to actual field performance

of cold-climate heat pumps. The reports are listed below and represent the most frequently cited literature that has been published on field performance of cold-climate heat pumps.

1) Commonwealth Edison Company (2020). Cold Climate Ductless Heat Pump Pilot Executive Summary. Chicago, IL. https://www.comedemergingtech.com/images/documents/ComEd-Emerging-Technologies-Cold-Climate-Ductless-Heat-Pump.pdf

2) ISO New England (2020), Final 2020 Heating Electrification Forecast. Holyoke, MA. https://www.iso-ne.com/static-assets/documents/2020/04/final_2020_heat_elec_forecast.pdf

3) The Levy Partnership/NYSERDA (2019). Downstate (NY) Air Source Heat Pump Demonstration. Albany, NY. https://static1.squarespace.com/static/5a5518914c0dbf4226cd5a8e/t/5d963d39f515f87c7bafe3ff/1570127329734/TLP+ASHP+Demo+Presentation+9.26.19.pdf

4) slipstream/Michigan Electric Cooperative Association (2019). Dual Fuel Air-Source Heat Pump Monitoring Report. Grand Rapids, MI. https://slipstreaminc.org/sites/default/files/documents/research/dual-fuel-air-source-heat-pump-pilot.pdf

5) Center for Energy and Environment (2018). Case Study 1 – Field Test of Cold Climate Air Source Heat Pumps. St. Paul, MN. https://www.mncee.org/MNCEE/media/PDFs/ccashp-Study-1-Duplex.pdf

6) Center for Energy and Environment (2018). Case Study 2 – Field Test of Cold Climate Air Source Heat Pumps. Minneapolis, MN. https://www.mncee.org/MNCEE/media/PDFs/ccashp-Study-2-MPLS.pdf

7) Center for Energy and Environment/Minnesota Department of Commerce, Division of Energy Resources (2017). Cold Climate Air Source Heat Pump. Minneapolis, MN. https://www.mncee.org/MNCEE/media/PDFs/86417-Cold-Climate-Air-Source-Heat-Pump-(CARD-Final-Report-2018).pdf

8) The Cadmus Group/Vermont Public Service Department (2017). Evaluation of Cold Climate Heat Pumps in Vermont. Montpelier, VT. https://publicservice.vermont.gov/sites/dps/files/documents/Energy_Efficiency/Reports/Evaluation%20of%20Cold%20Climate%20Heat%20Pumps%20in%20Vermont.pdf

9) The Cadmus Group/Massachusetts and Rhode Island Electric and Gas Program Administrators (2016). Ductless Mini-Split Heat Pump Impact Evaluation. MA and RI. http://www.ripuc.ri.gov/eventsactions/docket/4755-TRM-DMSHP%20Evaluation%20Report%2012-30-2016.pdf

10) Center for Energy and Environment/American Council for an Energy-Efficient Economy/Minnesota Department of Commerce, Division of Energy Resources (2016). *Field Assessment of Cold Climate Air Source Heat Pumps*. 2016 ACEEE Summer Study on Energy Efficiency in Buildings. https://www.aceee.org/files/proceedings/2016/data/papers/1_700.pdf

11) Steven Winter Associates, Inc./National Renewable Energy Laboratory (2015). Field Performance of inverter-Driven Heat Pumps in Cold Climates. VT and MA. https://www.nrel.gov/docs/fy15osti/63913.pdf

12) The Levy Partnership and CDH Energy Corp./NYSERDA (2014). Measured Performance of Four Passive Houses on Three Sites in New York State. Albany, NY. https://static1.squarespace.com/static/5a5518914c0dbf4226cd5a8e/t/5ab273db562fa758761512bd/1521644514205/Measured-Performance-of-three-Passive-Houses+%283%29.pdf

Additional field studies of cold-climate heat pump performance are known to be currently underway in Massachusetts and New York, but no information has been published relating to their scope or results.

Briefly, the published field-testing reports show a significant drop in actual, cold-climate heat pump performance compared to manufacturer efficiency ratings. Many of the reports showed efficiencies that were 20 to 30 percent lower than manufacturer ratings. Identified causes included excessive compressor cycling under part-load conditions, sub-optimal defrost operation, and airflow restrictions in indoor units. Some of the efficiency differences can also be attributed to manufacturer ratings that are based on weather data for USDOE Climate Zone 4, which covers much of the warmer, mid-Atlantic region.

The analyses provided in this document include, however, the expectation that cold-climate heat pumps will achieve 25% improvements in COP performance by the year 2030, in response to the USDOE Heat Pump Challenge, stricter State mandates, and general product improvements by manufacturers.

The referenced reports also include a substantial volume of data regarding the underutilization of heat pumps by homeowners during the winter. The reports discuss occupant concerns about comfort, operating cost, and system capacity during cold weather.

These technical notes are also based on resources from Argonne National Laboratory (GREET model), the National Renewable Energy Laboratory (NREL), and the United Nations Intergovernmental Panel on Climate Change (UN IPCC) 2019 guidance update on life-cycle analysis of fuels and power generation.

Evaluations of capital expenses in these technical notes are based a number of recently published reports, including the 2021 Avoided Energy Supply Component Update report prepared by Synapse Energy Economics for electric utilities and state regulatory agencies located in the ISO New England grid. Two reports from the National Renewable Energy Laboratory (NREL) were also used, including “Cost Projections for Utility-Scale Battery Storage 2021 Update” and “2020 Cost of Wind Energy Review”. A report by the Brattle Goup entitled, “Marginal Cost of Service Study”, prepared for Con Edison, was also used.

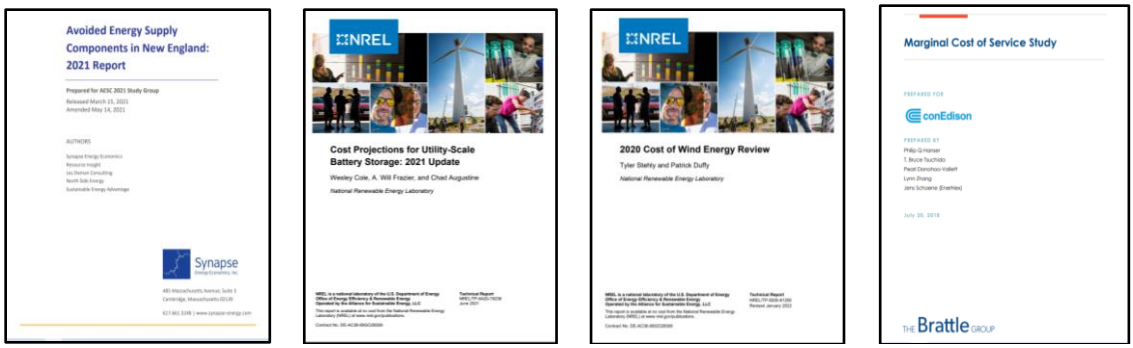


Figure 2. References Used in Capital Expense Evaluations

EVALUATION OF RESULTS FROM FIELD TESTING OF COLD-CLIMATE AIR-TO-AIR HEAT PUMPS

The efficiency of cold-climate air-to-air heat pumps in the field has been documented as 20% to 30% below current manufacturer ratings. Based on the data included in the reports listed above, I have put together a series of graphs that illustrate heat pump performance and homeowner characteristics noted regarding utilization of their heat pumps.

The first graph below shows heat pump Coefficients of Performance (COPs) vs. outdoor temperature, as derived from the field testing studies. The graph includes average manufacturer ratings of heat pumps (red data curve) used in the various field studies listed above. The graph also shows actual field testing results published in the listed reports. The graph shows how heat pump COPs vary with outdoor temperature. It is also possible to see the trend of actual performance falling below manufacturer ratings for most studies.

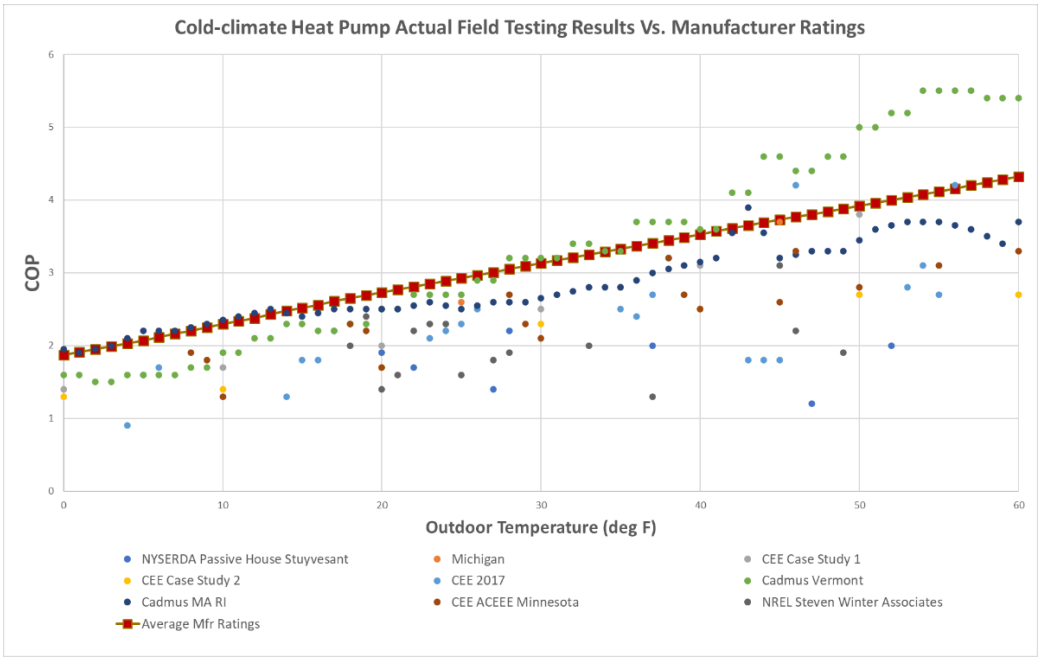


Figure 3. Cold-climate Heat Pump Actual Field-Testing Results vs. Manufacturer Ratings

Figure 4 following shows annual, cold-climate heat pump COP field data as published by the references used for these technical notes. Annual cold-climate heat pump COPs indicate much lower field efficiency than manufacturer ratings. Higher reported field efficiency by VT and MA/RI field testing was due to low utilization in colder weather, thus skewing the statistics. Power demand graphs in the cited references indicate that the drop-out rate increased as the outdoor temperature went down. As noted again, such homeowner behavior resulted in artificially high measured, annual COP values since the performance data was skewed toward warmer temperatures. The remaining studies generally entailed, by design or mandate, a high utilization factor through the winter, but then lower COP values.

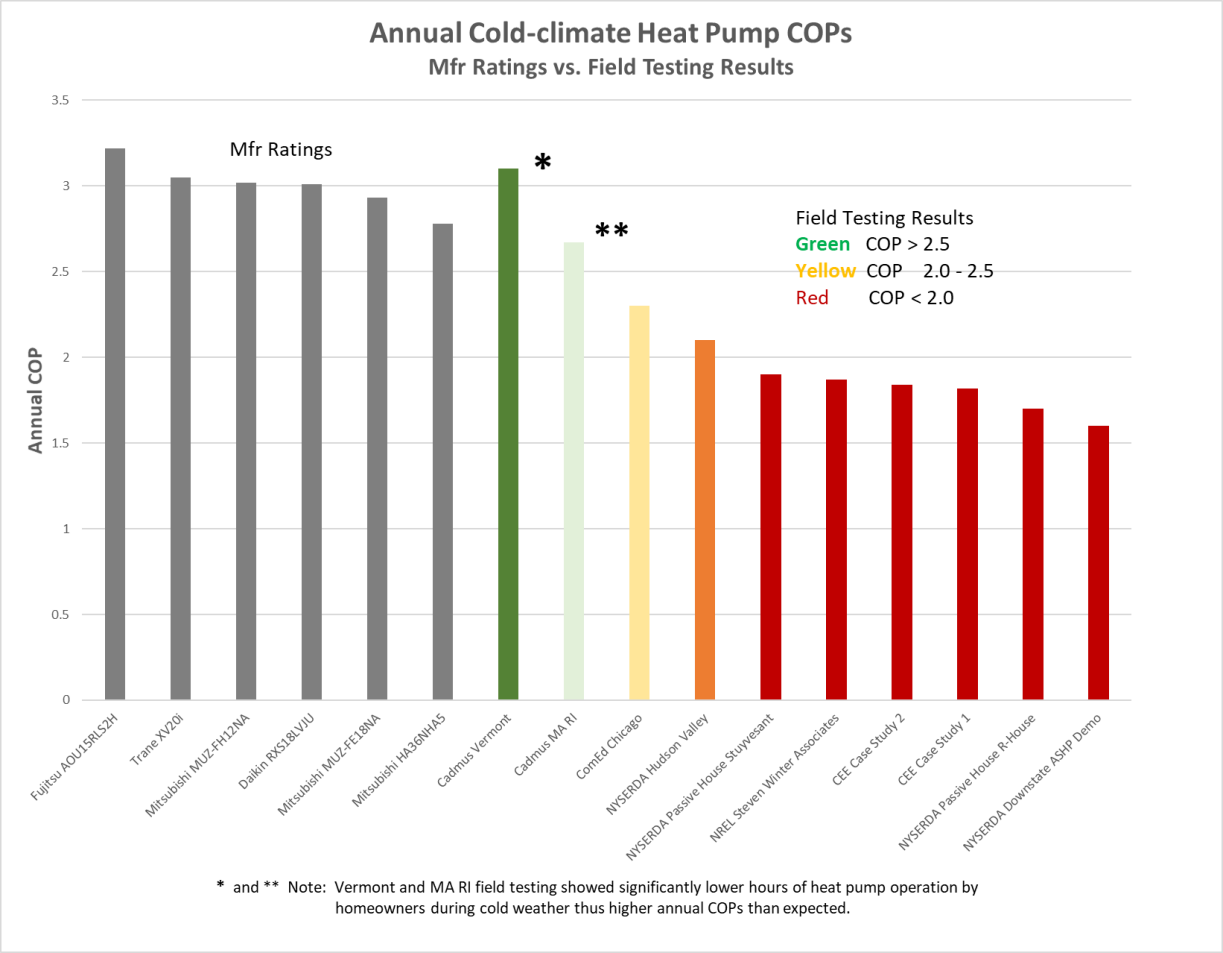


Figure 4. Annual Cold-climate Heat Pump COPs – Manufacturer Ratings vs. Field Testing Results

The manufacturer-rated seasonal COPs are generally around 3 or so, but the actual field testing results show values in the range of about 1.6 to 2.3 (see color coding of graph bars), which translates into a loss of about 20 to 30% from the manufacturer-rated values. The resulting conclusion is that, especially if the lower COP figures are combined with the use of marginal/non-baseload carbon intensity figures for power generation (instead of average grid mix figures), plus life-cycle analysis of natural gas used for power generation, the GHG savings of cold-climate heat pumps, compared to traditional oil-fired systems, are significantly diminished compared to popular claims by electrification proponents.

USE OF MARGINAL EMISSION RATES IN EVALUATION OF ELECTRIFICATION MEASURES

A recent publication by the Rocky Mountain Institute (RMI) states that a growing number of environmental organizations, when evaluating the emissions impacts of changes to grid loads or power production, "have been mis-applying average emissions factors to estimate the impact of environmental decisions. To protect against this mistake, the correct way to measure the impact of environmental decisions is to use *marginal* emissions factors. Marginal emissions factors measure the actual environmental consequences of taking different potential actions on the power grid."

The use of average grid mix figures has unfortunately become pervasive among electrification advocates in the Northeast. Average grid mix figures result in a severe underestimation of increases in CO2 emissions that would result from implementation of electrification measures at a faster pace than construction of renewable power generation resources.

See additional details in the informative RMI document entitled, On the Importance of Marginal Emissions Factors for Policy Analysis, which is available at https://rmi.org/combating-climate-change-measuring-carbon-emissions-correctly/ and also attached as an appendix at the end of this document.

See also https://www.watttime.org/app/uploads/2019/03/Automated-Emissions-Reduction-Primer_RMI-Validation_June2017.pdf and https://www.watttime.org/marginal-emissions-methodology/ for multiple additional references on the use of marginal emission rates for energy analysis. WattTime is a new, not-for-profit organization, and subsidiary to the Rocky Mountain Institute, which collects and disseminates hourly, real-world data on grid performance to enable informed, environmentally responsible electricity choices by large customers.

USE OF LIFE-CYCLE ANALYSIS OF ENERGY RESOURCES

It is of critical importance to use life-cycle analysis for energy policymaking. Onsite-based emissions evaluations generally fail to realistically address the real-world performance of the power grid. Argonne National Laboratory has been the host administrator of the Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies (GREET) model for many years. The GREET model is a highly respected tool for evaluating the life-cycle characteristics of energy resources. The United Nations Intergovernmental Panel on Climate Change (UN IPCC) has issued a series of updates to its comprehensive documentation relating to evaluation of energy resources.

Both GREET and IPCC provide clear guidance on the evaluation of upstream emissions of energy resources. Notably, both have recently addressed the problem of methane leakage in compounding the environmental impact of natural gas, including that used for power generation. MassDEP and MADOER energy policymakers are strongly encouraged to join the international community in recognizing and quantifying the environmental impact of methane leakage on the carbon intensity of electrification technologies.

The two major reference sources for life-cycle analysis used in the preparation of these notes, including the Argonne National Laboratory GREET 2021 model, as well as the recent United Nations Intergovernmental Panel on Climate Change (IPCC) 2019 update report on guidance for life-cycle assessment protocols, have correctly addressed the environmental characteristics of natural gas used for power generation. Both the GREET and IPCC references incorporate a methane leakage rate of

approximately 0.7% of the volume of natural gas used for power generation. This accounts for methane loss during natural gas production and high-pressure transmission directly to power plants, but not through any local distribution piping.

If a 100-year timeframe is used for analysis (GHG factor for NG = 25 compared to CO2), the 0.7% methane leakage rate results in about a 9 percent increase in the carbon intensity of natural gas that reaches the power plant. If a 20-year timeframe is used, however, for analysis (GHG factor for NG = 84 compared to CO2), the 0.7% methane leakage rate results in about a 20+ percent increase in the carbon intensity of natural gas used for power generation. There is growing support, and mandate in neighboring New York, for the use of 20-year greenhouse gas analysis since that reflects the timeframe that is now perceived as necessary for addressing climate change.

Combined with the impact of an approximate 10% increase in carbon intensity resulting from direct CO2 emissions during natural gas production and high-pressure transmission, the CO2e emissions characteristic of natural gas used for power generation is approximately 30% higher than the 117 lb/MMBTU onsite emissions figure frequently used by electrification proponents, thus approximately 152 lb/MMBTU.

GREET 2021 model figures are used for other fuel-based options included in the analysis presented here. The GREET figure of 185 lb/MMBTU (20 year LCA basis) is used for natural gas in residential and commercial heating, thus reflecting the additional methane losses that are incurred in local distribution networks. The GREET figure of 223 lb/MMBTU (20 year LCA) is used for distillate heating oil. GREET 2021 figures of 29 lb/MMBTU and 73 lb/MMBTU are used respectively for biodiesel produced from waste feedstock and virgin soy oil.

National Renewable Energy Laboratory (NREL) figures are used for evaluating renewable natural gas (RNG) and wind power. Carbon intensity data for RNG are sparse in availability, but indicate that RNG can have approximately the same sustainability values as has been documented for biodiesel. NREL carbon intensity figures for wind likewise are sparse.

ACCOUNTING FOR TRANSMISSION AND DISTRIBUTION LINE LOSSES IN ANALYSIS OF GRID IMPACTS OF ELECTRIFICATION

When the electrical load increases in a building, the corresponding increase in necessary power generation will be greater due to line losses that occur between the powerplant and end-use sites. The average line loss in transmission and distribution networks will usually be somewhere in the range of 8 percent here in the northeastern US. This factor must be included in analyses of electrification and renewable power generation to maintain accuracy of results. The practical consideration is that the MW amount of renewable power generation necessary to serve an increased grid load will be measurably greater than the load itself. The EPA AVERT model incorporates an automatic, built-in calculation of approximately 8% line losses. It is noted here, however, that since line losses are an I^2R issue, with losses proportional to the square of the current flow rate, thus not just a linear relationship, the incremental losses for increased grid loads during peak periods will typically be in the mid-teen percentage range, with the exact figure defined as the calculus derivative of the governing, line-loss mathematical equation. The significant policy impact of increased line losses during peak grid load conditions, due to electrification, needs to be recognized and addressed by energy policymakers.

POWER GRID ANALYSIS SOFTWARE

I used USEPA AVERT (AVoided Emissions and geneRation Tool) software to do an hourly analysis of grid impacts from residential and commercial heat pumps and to calculate required capacities of renewable power, including offshore wind, onshore wind, and utility-scale solar that would be necessary to meet expected Massachusetts heating loads using heat pumps.

See https://www.epa.gov/avert and https://www.epa.gov/avert/avert-overview-0 for more information about the AVERT program.

USEPA's AVERT software performs deep analysis using marginal emission rates, rather than average grid mix values which are incorrectly used by many energy policymakers in the northeastern United States (see article by the Rocky Mountain Institute in the Appendix). AVERT analyzes how power plants would increase/decrease their output in response to grid load changes, and what the corresponding changes in fuel use and emissions would occur. AVERT software uses the EPA national air markets database, which incorporates hourly efficiency and emissions performance data for all power plants in the United States over 25 MW capacity.

AVERT software can calculate the hourly, regional marginal impact of reductions in grid load due to energy efficiency measures, as well as increases in grid load due to intentional load-building measures such as heat pumps and electric vehicles. AVERT software also can predict the hourly, marginal impact of renewable generation by resources such as solar PV and wind power, using hourly weather data. AVERT also predicts local changes in power generation output levels by individual generating plants within a specified region.

The AVERT 4.0 software version released just recently also incorporates direct linkage with USEPA Co-Benefits Risk Assessment (COBRA) public health and Sparse Matrix Operator Kernel Emissions (SMOKE) air quality input software packages. This allows for direct modeling of public health and air quality impacts (NOx/SOx etc.) of changes in load or generation output within a regional grid. This enables the evaluation of air quality deterioration in environmental justice and LMI communities located adjacent to fossil-fired power plants as grid loads increase due to electrification.

AVERT spreadsheets are somewhat bulky, with typically close to 9,000 rows in height and many columns wide, but are nevertheless relatively user-friendly. Ancillary spreadsheet analysis of grid loads, using digital, hourly (8760 hours per year) weather data and heat pump performance formulas, can be easily copied into AVERT spreadsheets to yield highly informative, power generation and emissions outputs. MassDEP and MADOER energy policymakers are encouraged to use AVERT software if they are not already doing so.

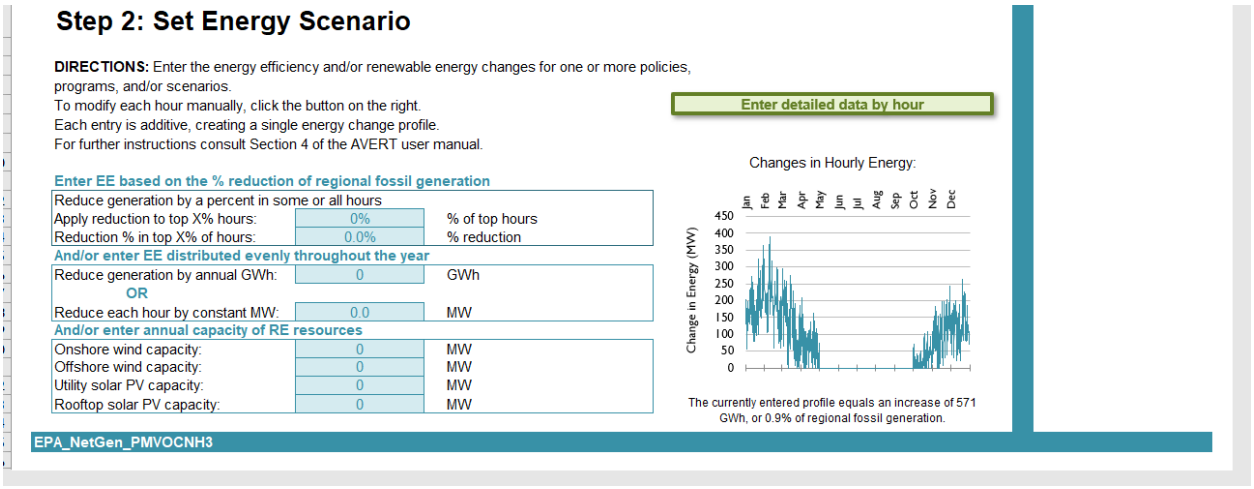


Figure 5. Example data input page for USEPA AVERT software

The screenshot shown above in Figure 5 shows an example graph of monthly grid loads that would be triggered by implementation of residential and commercial heat pumps. The AVERT program also allows for specification of renewable power capacities that might offset increasing grid loads.

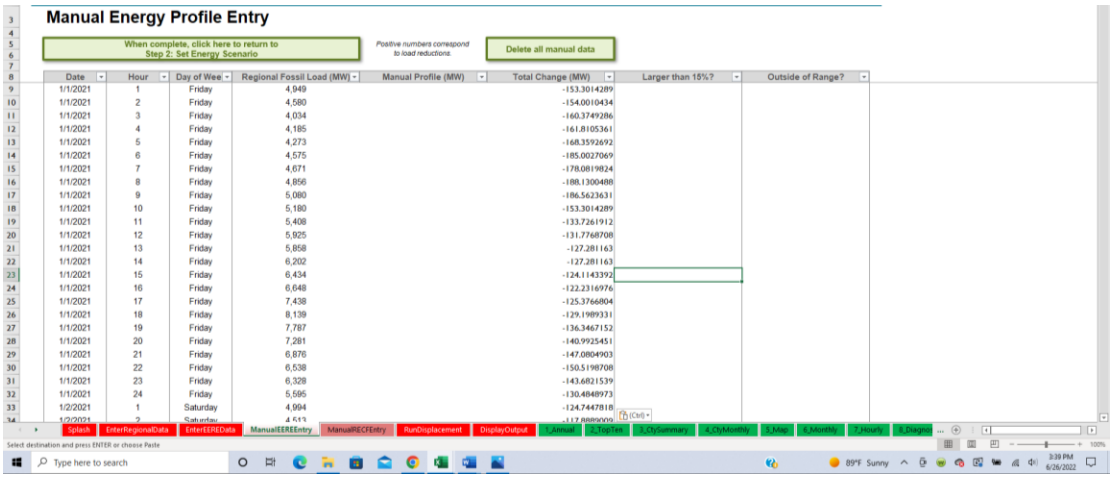


Figure 6. Example screenshot of USEPA AVERT software – manual input of grid load data

The AVERT software incorporates the manual input of MW grid load values, as shown in Figure 5 above, based on calculated heating loads, heat pump COPs, and resulting site electrical load increases. The software then calculates impacts on power plant generation and CO2 emissions, as well as other pollutants such as NOx, SOx and PM2.5 particulates.

Output: Annual Regional Results

Click here to return to Step 4: Display Outputs

	Original	Post Change	Change
Generation (MWh)	61,220,480	61,791,760	571,280
Heat Input (MMBtu)	506,770,570	511,492,860	4,722,290
Total Emissions from Fossil Generation Fleet			
SO2 (lb)	3,060,270	3,103,060	42,790
NOx (lb)	15,529,130	15,711,810	182,680
Ozone season NO_x (lb)	8,314,720	8,314,720	—
CO_2 (tons)	30,295,030	30,577,870	282,840
PM2.5 (lb)	4,845,880	4,895,770	49,890
VOCs (lb)	1,961,390	1,983,790	22,400
NH3 (lb)	2,014,380	2,040,050	25,670
AVERT-derived Emission Rates:	Average Fossil		Marginal Fossil
SO2 (lb/MWh)	0.050		0.075
NOx (lb/MWh)	0.254		0.320
Ozone season NO_x (lb/MWh)	0.279		#VALUE!
CO_2 (tons/MWh)	0.495		0.495
PM2.5 (lb/MWh)	0.079		0.087
VOCs (lb/MWh)	0.032		0.039
NH3 (lb/MWh)	0.033		0.045

Ozone season is defined as May 1 - September 30. Ozone season emissions are a subset of annual emissions.
Negative numbers indicate displaced generation and emissions.
All results are rounded to the nearest ten. A dash ("—") indicates a result greater than zero, but lower than the level of reportable significance.

This region features one or more power plants with an infrequent SO2 emissions event. SO2 emissions changes from these plants are not included in this analysis. See Section 2 of the AVERT User Manual for more information.

Figure 7. Example screenshot of AVERT summary output page showing annual generation and emissions impacts.

As shown in Figure 7 above, AVERT software produces an array of output tables and graphs ranging from hourly to annual figures. The information can then be further processed to evaluate the environmental characteristics of changes to grid loads or generation outputs.

Generation (MW) New England (NE)

Click here to return to Step 4: Display Output

									ORSPL	58054	1595	55126	55126	55317	55149	56047	54907
									UNITID	ST01	4	CT01	CT02	11	LRG2	1	1
Hour	Year	Month	Regional L	Energy Ch	Load after Energy Ch	Timestamp	Orig Gen (	Post Chan	Sum: All U	Burgess Bic	Kendall Gr	Milford Pov	Milford Pov	Fore River	Lake Road (	CPV Towa	MIT Centr
1	2019	1	2259	1,652	3910.919	01/01/2019 00:00	2,252	3,932	1680.086	1.177	15.183	31.805	30.373	48.671	13.685	16.786	-0.897
2	2019	1	2288	1,652	3939.919	01/01/2019 01:00	2,281	3,953	1671.784	1.107	12.635	32.832	32.017	50.472	9.373	13.88	-1.166
3	2019	1	1944	1,498	3441.726	01/01/2019 02:00	1,938	3,445	1506.605	0.259	27.161	39.047	30.049	14.466	23.499	42.516	-2.135
4	2019	1	1879	1,448	3327.018	01/01/2019 03:00	1,874	3,320	1445.271	-1.702	30.659	34.215	35.429	5.892	28.018	47.653	-3.517
5	2019	1	1781	1,244	3024.919	01/01/2019 04:00	1,778	3,012	1233.478	-2.359	26.666	33.931	29.331	-14.675	35.82	51.917	-4.344
6	2019	1	1917	1,059	2976.402	01/01/2019 05:00	1,912	2,972	1059.843	-2.27	24.343	26.449	24.19	-6.853	26.897	38.558	-3.049
7	2019	1	2119	840	2959.374	01/01/2019 06:00	2,110	2,957	847.649	-2.337	16.266	19.244	14.552	-4.965	18.784	23.098	-1.841
8	2019	1	2201	812	3013.08	01/01/2019 07:00	2,193	3,002	809.47	-1.802	9.568	20.659	8.062	-6.425	19.769	22.993	-1.993
9	2019	1	2471	762	3232.892	01/01/2019 08:00	2,469	3,221	751.425	-2.262	12.232	17.54	11.142	23.524	9.864	17.605	-1.835
10	2019	1	2585	696	3281.418	01/01/2019 09:00	2,587	3,269	681.7	-4.347	8.473	16.756	8.087	11.175	13.911	19.563	-3.569
11	2019	1	2535	691	3226.034	01/01/2019 10:00	2,535	3,214	678.841	-3.715	10.385	17.41	11.112	14.819	12.411	16.443	-2.711
12	2019	1	2402	696	3098.418	01/01/2019 11:00	2,398	3,088	690.057	-0.462	10.929	17.98	8.341	24.219	8.756	12.084	-0.582
13	2019	1	2422	863	3285.225	01/01/2019 12:00	2,419	3,273	854.16	-0.596	13.278	17.522	8.945	32.854	7.434	20.611	-1.208

Figure 8. Example screenshot of AVERT output page showing hourly changes to individual power plant MW generation outputs

As shown in Figure 8 above, AVERT software yields estimates of hourly changes to generation output and emissions by individual power plants. This information helps to identify what environmental justice communities might be affected by increased emissions that result from grid load growth due to electrification programs, when not sufficiently offset by new, renewable power generation.

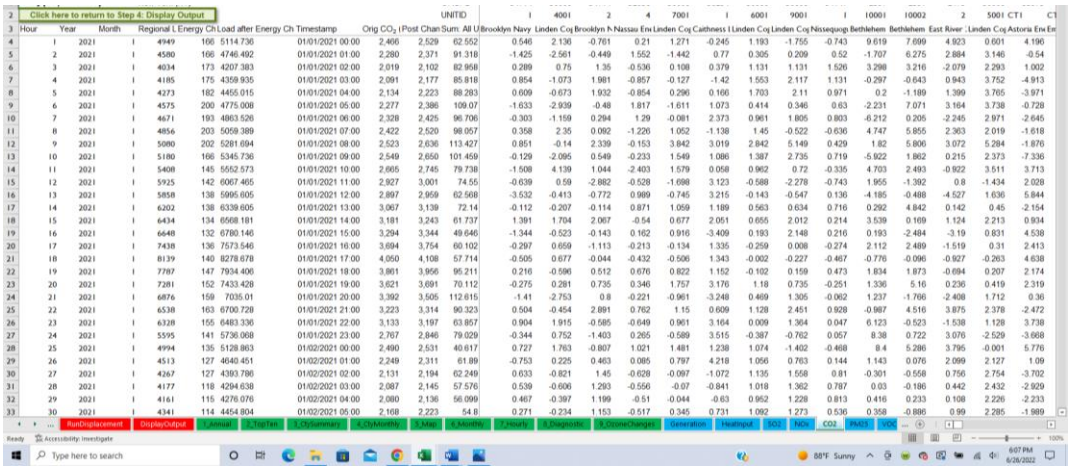


Figure 9. Example screenshot of AVERT output page showing hourly changes to individual power plant CO2 emission rates (lb/hr)

As shown in Figure 9 above, AVERT software also yields estimates of hourly changes to CO2 emissions from individual power plants. Such information is of key importance for the wholistic evaluation of environmental performance by a combined heating equipment-power grid system.

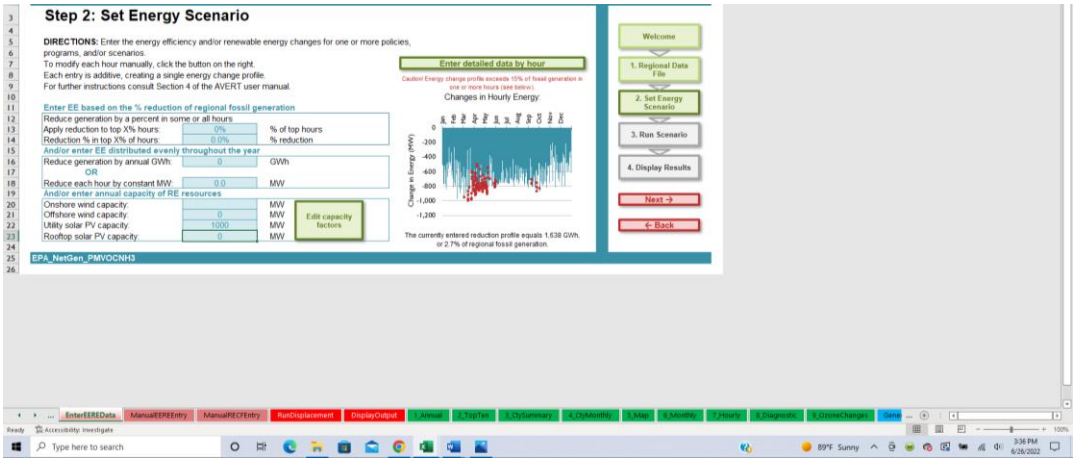


Figure 10. Example screenshot of AVERT input page showing MW quantities of renewable power generation capacity selected for analysis.

As shown in Figure 10 above, AVERT software also allows for the specification of amounts of wind and solar generation resources. The software then yields an hourly output table for the entire year, which can then be combined with grid load data to determine whether sufficient renewable power has been generated to meet the demand of electrification technologies, and if not, the quantity of fuel-based generation that must still be operated.

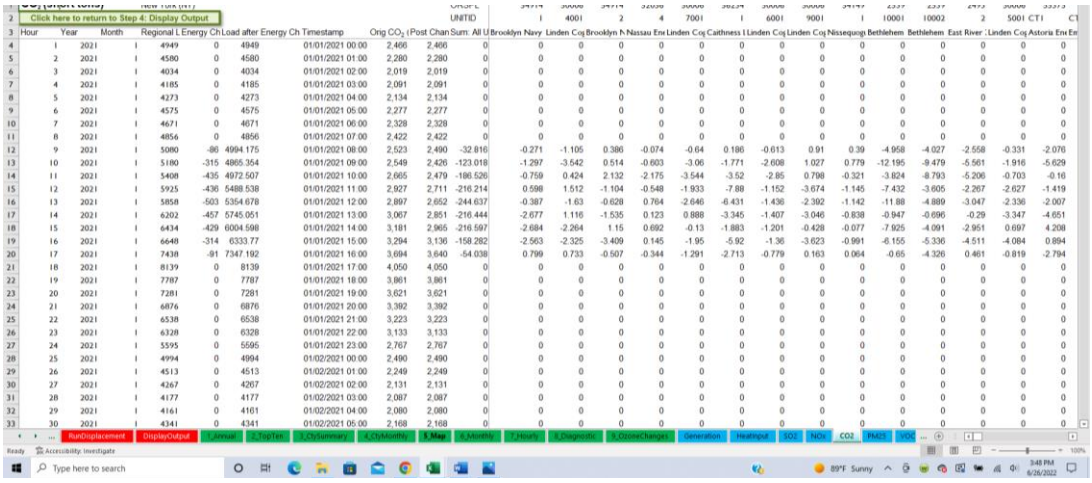


Figure 11. Example screenshot of AVERT output page showing hourly values of solar power output plus impact on individual power plants.

As shown in Figure 11 above, AVERT software calculates the hourly production of wind and solar power systems based on a typical year of weather data. The software then allocates reductions in generation output to individual power plants. The output data can then be combined with heating and grid load data to determine how much fuel-fired power generation might still be necessary if sufficient renewable power generation capacity has yet to be constructed.

METHODOLOGY FOR HOURLY EVALUATION OF COMBINED HEAT PUMP PERFORMANCE AND ISO NEW ENGLAND GRID CARBON INTENSITY FOR RESIDENTIAL AND COMMERCIAL HEATING

These technical notes are based on an hourly, coincidental temporal analysis of heating loads and power grid performance. Digital weather data from Visual Crossing.com for Springfield, MA was used to model hourly heating loads in a representative single-family residential unit that would have a peak heating load of 32,000 Btu/hr at an outdoor temperature of 5 deg F. The described heating load formula is intended to be broadly representative for residential buildings located in New England.

Temperature delta T values are determined using a base of 65 deg F as is customary for heating degree day analysis. Carbon intensities for common fuels including heating oil, natural gas, biodiesel and renewable natural gas are derived from the GREET 2021 model, as described earlier in this document. Heat pump COPs vs. outdoor temperature are determined through a formula based on the field test results included in the references described earlier.

Figure 12 below shows a screenshot of an Excel table that was created to perform the described hourly analysis of heating loads, grid performance, fuel/electricity input options, carbon intensities and resulting CO2 emission rates. The table includes input and output figures for the approximately 5000 hours that occur during the October through April heating season.

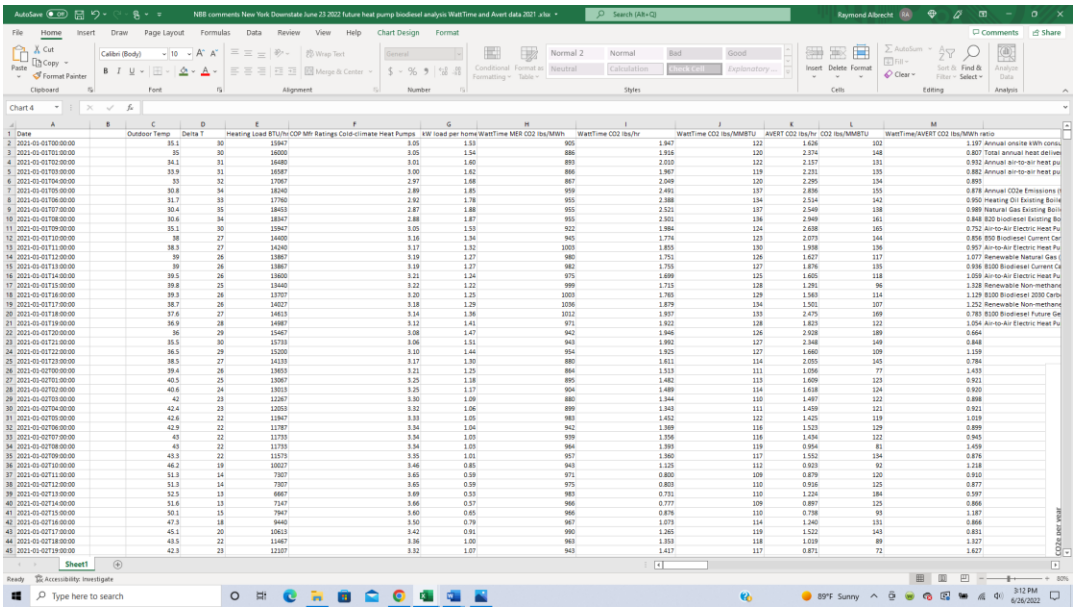


Figure 12. Screenshot of hourly heating system and power grid performance Excel analysis table.

After hourly heating loads and corresponding grid load increases have been determined, interim data from the Excel table are copied to the manual data input page of the AVERT software. The AVERT software then calculates generation and CO2 emissions changes, which are then transferred back to the Excel table to enable completion of the combined analysis.

WattTime hourly Marginal Emission Rates (MERs) in lbs CO2 per MWh for New England were also used in the Excel table to evaluate the grid impact of heat pumps. WattTime data does not provide for analysis of impacts on individual power plants but provides for a higher resolution analysis of geographical variations in carbon intensity between ISO New England zones.

ANALYTICAL RESULTS AND TECHNICAL COMMENTS

Annual CO2e Emissions for Single-family Homes in Massachusetts

Figure 13 below shows annual CO2e emissions for a single-family home in Massachusetts under several different technology options that are feasible by the year 2030. Massachusetts has approximately 2.6 million residential units plus a broad array of commercial, industrial and institutional buildings. Traditional fuel options include heating oil and natural gas. Renewable fuel options include biodiesel blends as well as B100 biodiesel. Heat pump options include current air-to-air technology plus improved, future generation technology. The graph also includes scenarios for the existing grid plus options for partial and full-capacity renewable power generation for operation of heat pumps. It needs to be noted that the option for full-capacity renewable power generation, which would be difficult to achieve by the year 2030, and which is shown as a long-term goal, also includes the requirement for 720,000 MWh of battery storage to be sufficient for 48 hours of operation during periods of extreme cold temperature with low offshore wind and solar output.

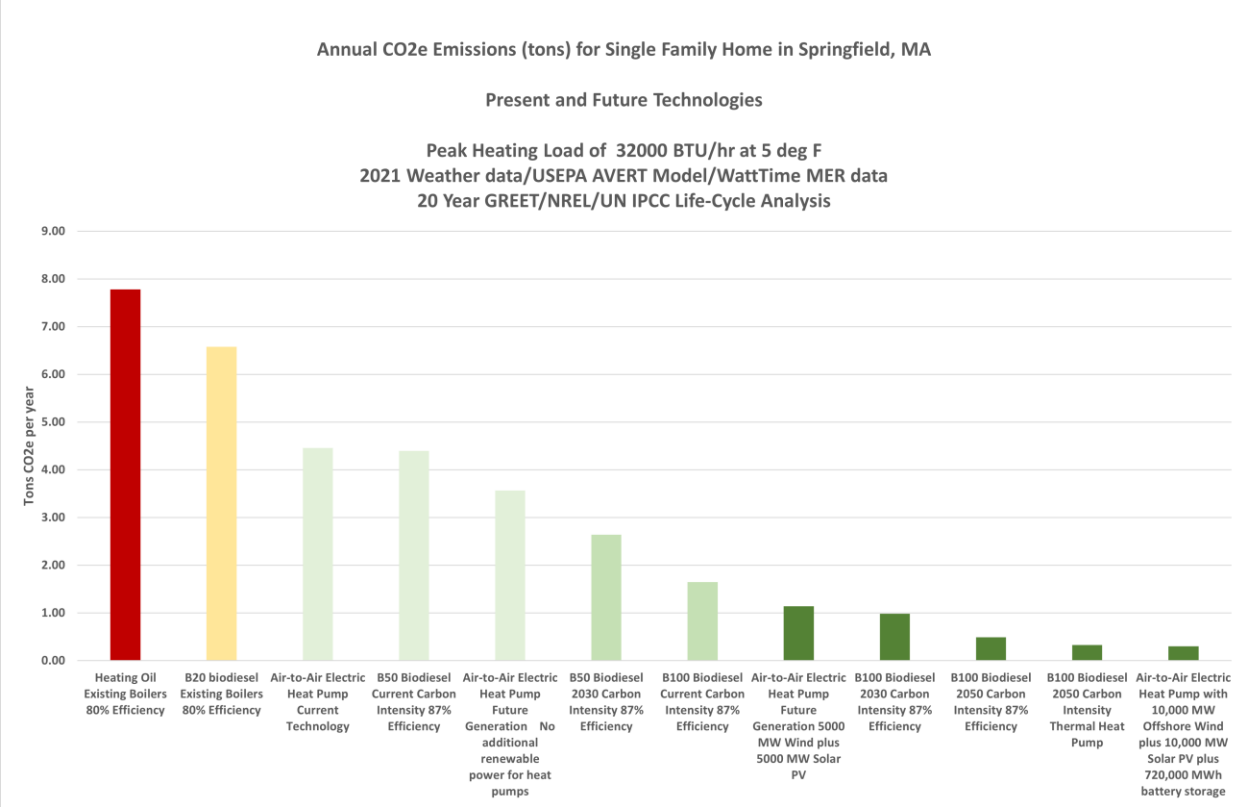


Figure 13. Annual CO2e Emissions for Single Family Homes in MA.

The individual graph bars in Figure 13 show similar, moderate savings, compared to traditional heating oil and natural gas-fired boilers, for current heat pump technology and basic (e.g., B20) biodiesel blends. There is then a general declining trend in CO2e emissions as biodiesel concentrations increase to the 50 and 100 percent levels, and as dedicated, combined offshore wind plus utility-scale solar capacity growth to 10,000 MW, and then 20,000 MW, nameplate capacity is accomplished. Dedicated offshore wind plus utility-scale solar capacity of 10,000 MW total would achieve CO2e savings for heat pumps of about 70 percent compared to heat pumps that use the existing grid, with an overall, seasonal carbon intensity that is approximately the same as for B100 biodiesel using an 87% efficient boiler. Dedicated renewable power capacity of 20,000 MW would provide for heat pump utilization during the peak heating periods of the winter but would require approximately 720,000 MWh of battery storage to maintain continued grid operation for up to 48 hours during low wind and solar output conditions.

The graph also shows carbon intensity values for B100 biodiesel-fired, absorption heat pumps. Such heat pumps can achieve efficiency levels of 120 to 130 percent, depending on manufacturing design, with future increases expected.

The hourly analysis performed for this evaluation shows that the carbon intensity of B50 biodiesel blend is approximately equal to, or somewhat higher than, heat pumps during mild weather, but significantly lower than heat pumps during cold weather, which is when the grid is under greatest stress. This raises the question of what energy resource strategy would be most effective during cold weather. The carbon intensity of B100 biodiesel is lower than all other existing energy options throughout nearly the entire temperature range.

To note, there are also wide variations in the carbon intensity for heat pumps due to the higher heat rates for power generation which occur during morning and evening peak periods. There is considerable merit to the argument that heat pump controls should be web-enabled and programmed to: 1) synchronize system operation with low-carbon intensity hours; and 2) switch to an alternate fuel source during hours of high carbon intensity on the grid.

The relative CO2e emissions shown in Figure 13 are applicable to both residential and small commercial heating systems. Biodiesel and heat pumps both offer alternative pathways to the end goal of carbon neutrality by 2050, but biodiesel offers the opportunity for immediate accomplishment of major CO2e savings through the use of B100, whereas heat pumps are dependent on the future expansion of offshore wind capacity or imports of other forms of renewable power, sufficient to reach the margin of grid power load, before they can even start to become fully renewable thermal energy resources.

Carbon Intensities Vs. Outdoor Temperature for Single Family Homes in MA

The following graph shows carbon intensities (lbs CO2e per MMBTU of delivered heat) for the same options as shown in Figure 12 above. It can be seen that the carbon intensity of future generation, cold-climate heat pumps will be higher than for B50 biodiesel blends at temperatures below 32 degrees F. This illustrates the problem that cold-climate heat pumps, while having lower carbon intensities than traditional heating oil, B20 biodiesel blends, and natural gas, are nonetheless more carbon intensive than B50 and higher biodiesel blends during cold weather.

Figure 14 also shows that the B100 option has lower carbon intensity than cold-climate heat pumps during all but 30 hours of the heating season, with such exceptions occurring exclusively during mild weather.

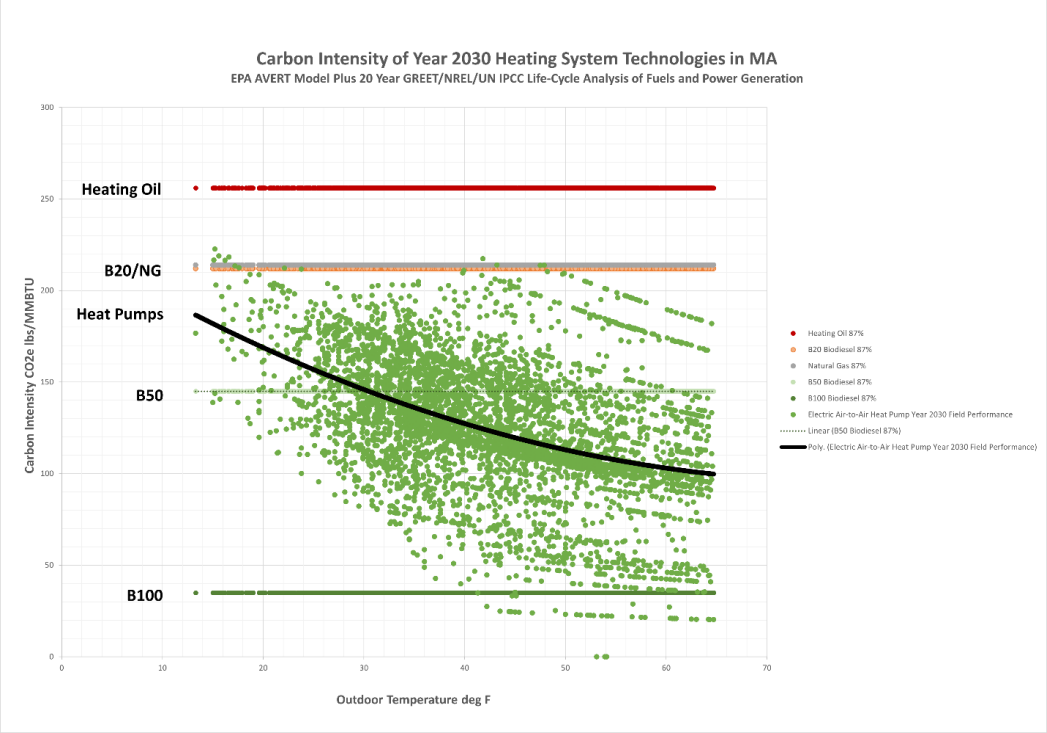


Figure 14. Carbon Intensity of Year 2030 Heating System Technologies vs. Outdoor Temperature

Increase in Grid Load Due to Electric Heat Pumps

Figure 15 shows an estimated grid load growth of more than 15,000 MW in Massachusetts for operation of residential and commercial heat pumps during peak winter conditions. The data are based on the presumption that whole-house heat pumps would be used with no fuel-fired back-up. Such grid load growth would be approximately double the existing winter peak load.

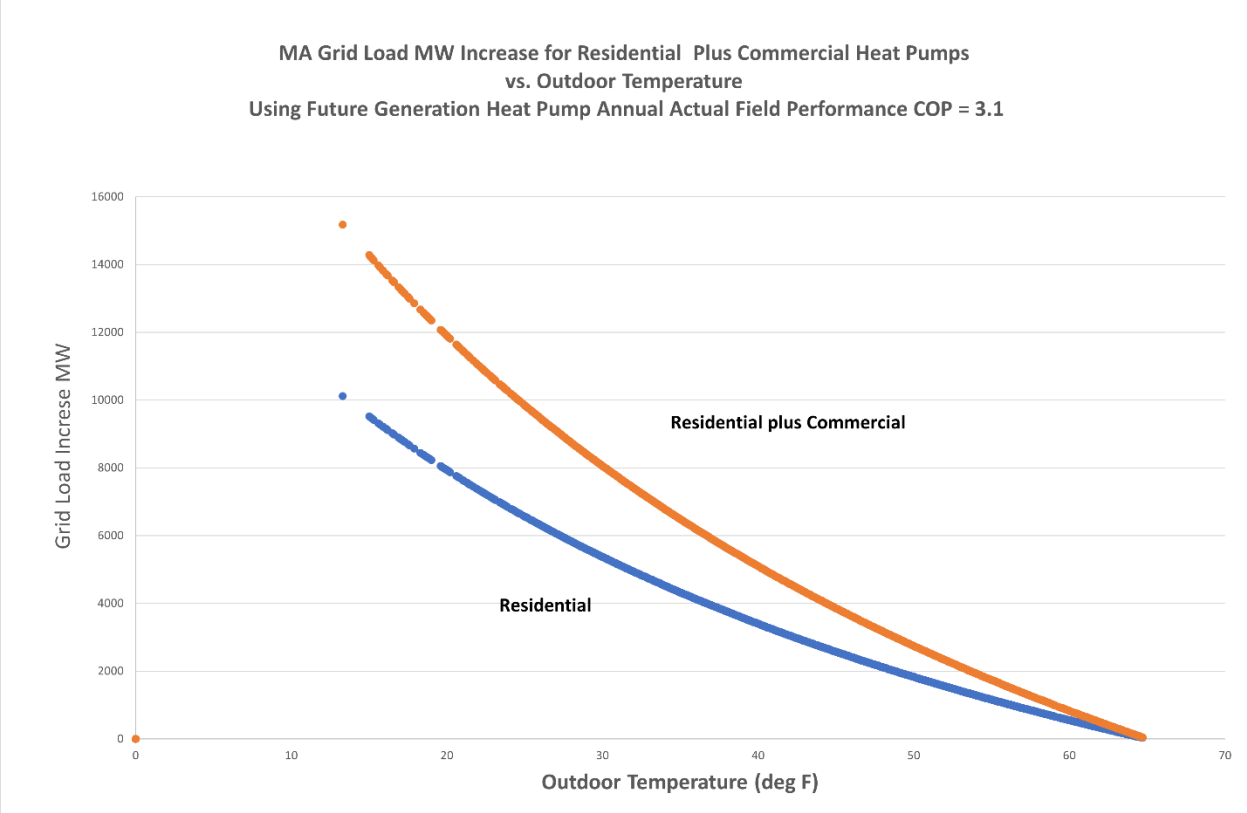


Figure 15. Grid Load Increase (MW) vs. Outdoor Temperature for Full Implementation of Residential and Commercial Heat Pumps in MA

ELECTRICAL DEMAND OF HEAT PUMPS – REALITY vs. EXPECTATIONS

Several of the references for these technical notes addressed the issue of homeowner utilization of heat pumps during the heating season. Especially in New England, there was a notable under-utilization of heat pumps during the winter, with operating hours often in the range of only 20 to 50% of technical potential.

The gray, yellow and light blue data in the graph below show average electrical demand vs. outdoor temperature trends within the heat pump populations of the three largest field studies. The graph shows a representative electric demand for a full-sized heat pump (bold dark blue data) with capacity of 40,000 Btu/hr at 0 deg F, also for a partial-sized heat pump (bold orange data) with a capacity of 15,000 Btu/hr at 0 deg F. The data curves for the three field studies show that actual electricity consumption

was only a small fraction of what would be expected with full heat pump utilization. Note that the actual electrical demand curves are relatively flat below 30 deg F which indicates very low heat pump utilization below 30°F. Since heat pump power demand increases dramatically as the outdoor temperature drops further, due to increasing heat load plus decreasing heat pump COP, this means further that the homeowner percentage drop-out rate is increasing as the temperature drops.

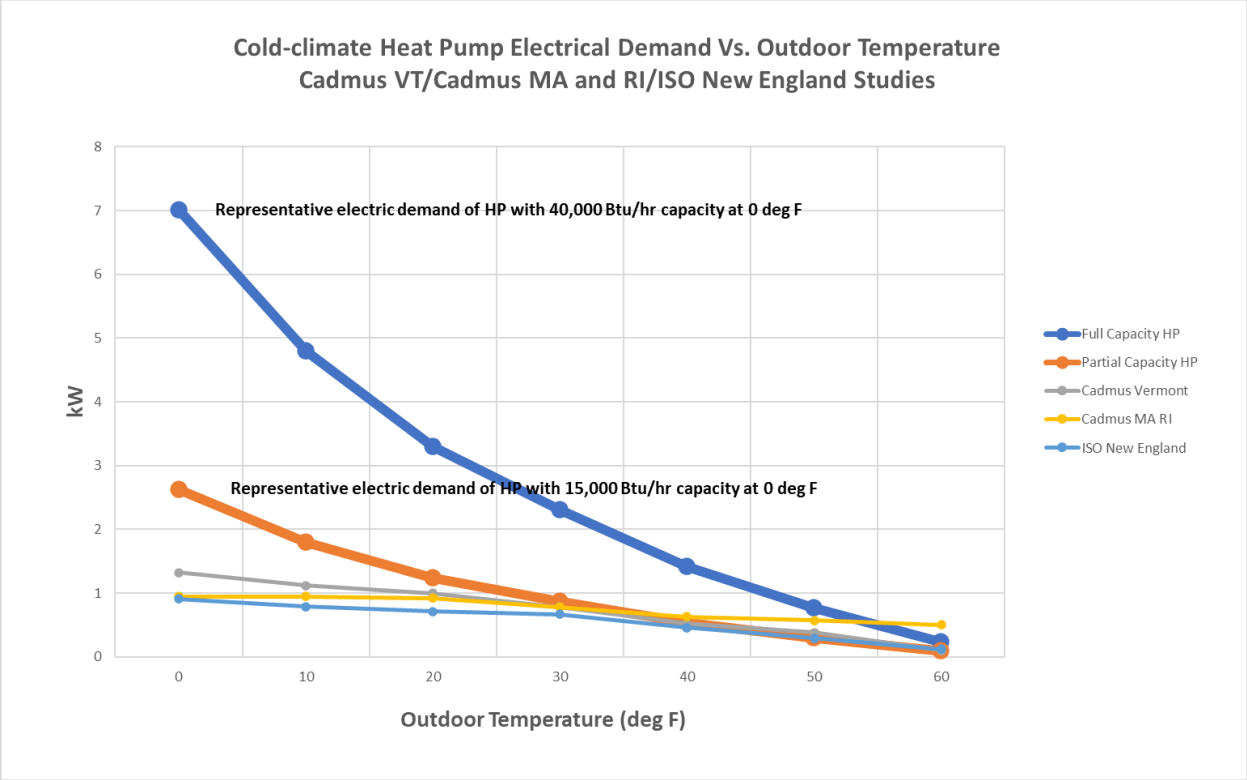


Figure 16. Cold-climate Heat Pump Electrical Demand vs. Outdoor Temperature

The bar graph below illustrates, in a different format, the same message re: low homeowner utilization of heat pumps during the winter. Homeowners have, on average, been using their heat pumps for less than half of the potential winter hours of operation. Some homeowners indeed used their heat pumps dutifully even during the coldest days of winter, but most dropped out at some point as the weather got colder, or never even turned on the systems at all for heating purposes.

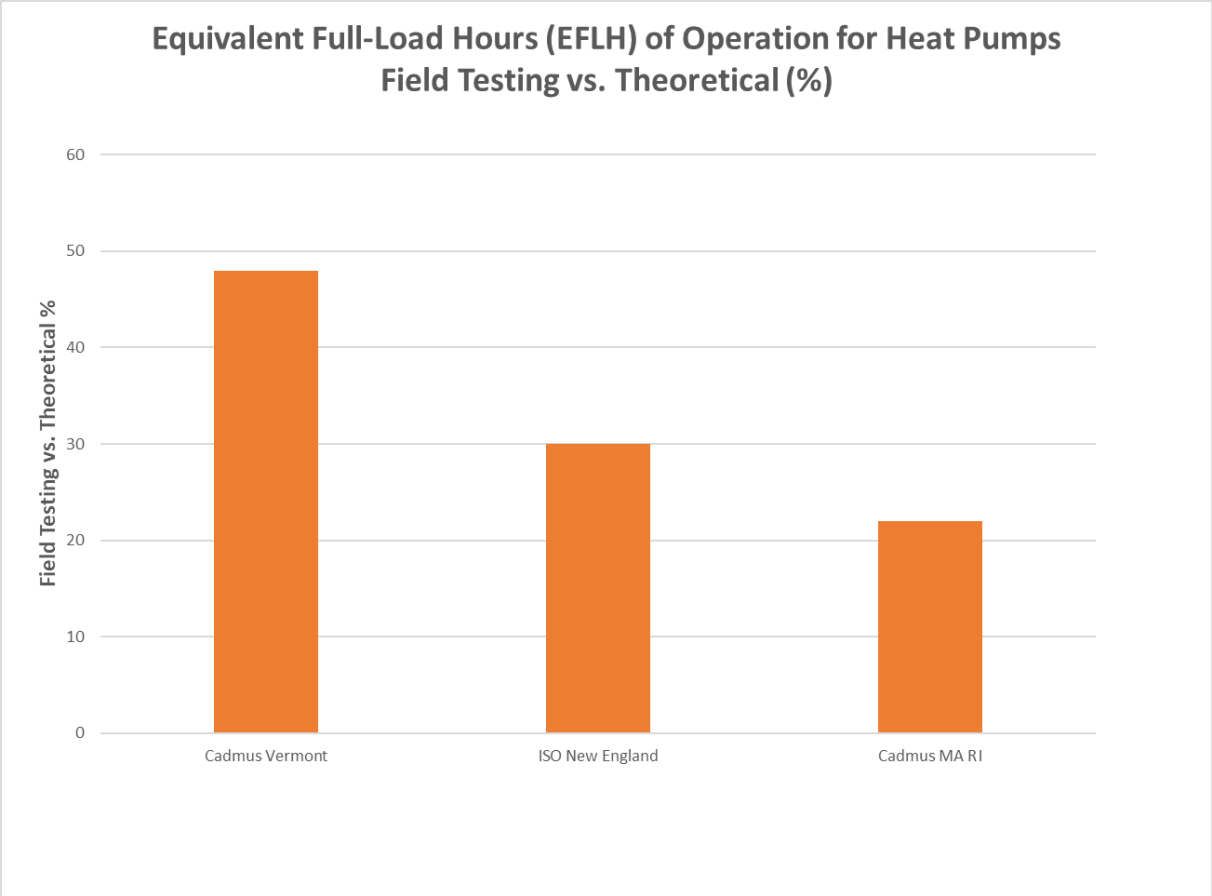


Figure 17. Equivalent Full-Load Hours of Operation for Heat Pumps

This raises the thorny issue of homeowners taking advantage of heat pump incentive programs to purchase systems that are used substantially for cooling and only partially for heating, of whether upfront incentives vs. pay-for-performance should be provided to homeowners, and whether ratepayer vs. utility shareholder funds should be used for heat pump incentive programs. There is direct relevance of the heat pump utilization question to policymaking for incentive programs in Massachusetts.

CAPITAL COSTS OF ELECTRICITY GRID UPGRADES IN MASSACHUSETTS FOR IMPLEMENTATION OF RESIDENTIAL AND COMMERCIAL HEAT PUMPS

Wind and solar projects planned for the next 10 to 20 years in Massachusetts, even if fully developed, will make a good start toward eliminating fossil generation for existing grid loads, but will not provide the substantial growth in capacity necessary for full implementation of heat pumps in the residential and commercial building sectors. Substantial capital investments will be required beyond current plans for renewable power generation and battery storage to replace fossil-based generation that would be necessary to meet increased grid loads. Major investments will also be required for transmission and distribution networks to allow renewable electricity to reach end-use customers.

Figure 15 earlier in this document shows an estimated grid load growth in Massachusetts of about 15,000 MW resulting from operation of residential and commercial heat pumps during peak winter conditions. The data are based on the presumption that whole-house heat pumps would be used with

no fuel-fired back-up. Such grid load growth would approximately double the existing winter peak load in the MA zone of ISO New England.

The next graph shows an example combination of offshore wind and utility-scale solar PV nameplate capacities that could meet the winter heating loads of cold-climate heat pumps for residential and commercial buildings in Massachusetts. The blue bars represent monthly MWh consumption by residential and commercial heat pumps assuming full market penetration. The orange bars represent monthly MWh production by 10,000 MW of nameplate capacity offshore wind power. The gray bars represent MWh production by 10,000 MW of nameplate capacity solar PV power. Monthly MWh production figures are provided by the USEPA AVERT model based on historical weather data for the New England region.

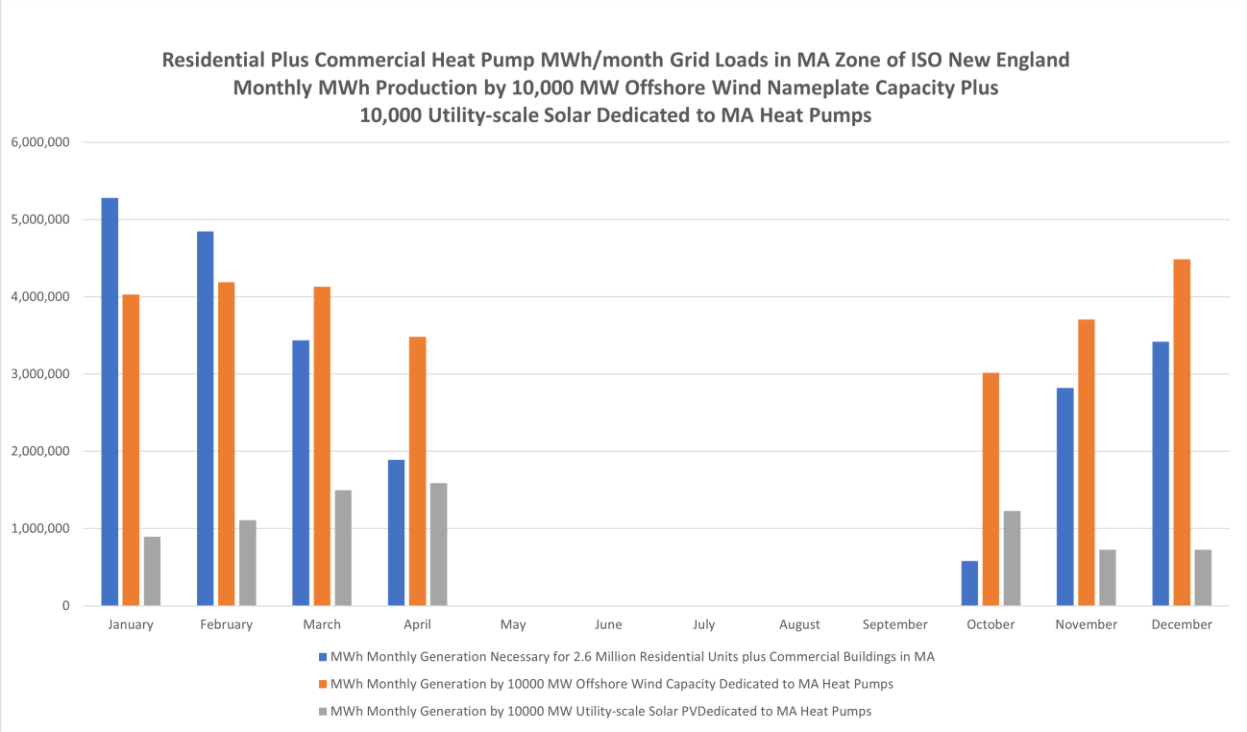


Figure 18. MA Monthly Grid Loads for Residential and Commercial Heat Pumps Plus 10,000 MW Wind Capacity Plus 10,000 MW Solar PV Nameplate Capacity

The graph indicates that an installed nameplate capacity of 10,000 MW of offshore wind plus 10,000 MW of solar PV power will approximately meet the needs of residential and commercial heat pumps in the MA zone of ISO New England during the coldest months of the heating season, assuming sufficient availability of battery storage. If it were possible to install the described 10,000 MW of offshore wind capacity at a cost of $5 million per MW, and the 10,000 MWh of solar PV capacity at a cost of $3 million per MW, the total capital expense would be approximately $80 billion. If floating-type offshore wind platforms are required, however, due to water depths greater than 180 feet, an upward revision to the wind turbine capital expense figure would become necessary.

For a MA peak grid load of about 15,000 MW for residential and commercial heat pumps, the required nominal, 48 hour, battery storage capacity, to enable continued operation during extended cold temperature and low windspeed conditions, would be approximately 720,000 MWh.

If utility-scale battery storage were to cost $200,000 per MWh capacity, based on NREL mid-range cost projections for the year 2030, the capital expense for battery storage would be approximately $120 billion, to cover the 48 hour storage discharge needed during a wind drought. This figure may be subject to adjustment, however, based on battery material price increases or decreases which might occur as the wind and solar industries grow. Increased production volumes may contribute to economies of scale, which might provide downward pressure on costs. Increased volumes of mining and extraction of materials for batteries, on the other hand, could trigger higher prices due to supply shortages. Lithium and cobalt commodity prices have recently increased multi-fold with corresponding upward pressure on battery storage prices.

Increased grid transmission capacity in Massachusetts would also be necessary to enable full implementation of residential and commercial heat pumps. While transmission upgrade costs will vary widely on a local basis depending on existing capacity and load characteristics, this analysis uses an average annual cost figure of $94 per kw-yr for New England, as developed in the 2021 Avoided Energy Supply Component Update report by Synapse Energy Economics for electric utilities and state regulatory agencies located in the ISO New England grid. The $94 figure represents a combination of construction and also operating cost, e.g., labor, administration, insurance, and taxes. The corresponding, total combined capital and operating cost figure could have an order of magnitude of $2000 per kw of increased transmission capacity, although actual cost figures are highly dependent on specific circumstances. Using the figure of $2000 per kW of increased transmission capacity, the corresponding cost for 15000 MW of transmission upgrades in Massachusetts would be approximately $30 billion.

Increased local electricity distribution capacity would also be necessary for implementation of residential and commercial heat pumps in Massachusetts. Synapse Energy Economics has identified a wide range of accounting practices used by electric utilities in New England, with corresponding cost figures that range from *de minimis* to over $200 per kW-yr. More consistent accounting practices used in other states, such as New York, have indicated distribution upgrade costs ranging from $50 to $250 per kW-yr, representing variations in cost and difficulty of distribution network construction which occur in rural through dense urban environments. A corresponding, total combined capital and operating cost figure of $3000 per kW is used for this analysis. The corresponding cost for 15000 MW of transmission upgrades would be approximately $45 billion.

Recent capital cost analyses for residential heat pumps have centered on an approximate figure of $20,000 per onsite installation. The corresponding capital cost for installation of 2.6 million residential heat pumps in Massachusetts would be approximately $52 billion. The commercial building sector uses about 50% as much heating equipment capacity and energy consumption as the residential sector. The total capital cost for installation of residential and commercial heat pumps in Massachusetts would thus be approximately $80 billion.

The capital cost figures estimated above for offshore wind and solar PV generation capacity, battery storage, transmission and distribution upgrades, as well as for onsite installation of residential heat pumps, for full implementation of residential and commercial heat pumps in Massachusetts, are presented in the following table.

Time Horizon	10 yrs	20 yrs	30 yrs
Wind and Solar PV Generation	$ 80 billion	$ 80 billion	$ 80 billion
Battery Storage	$ 120 billion	$ 240 billion	$ 360 billion
Transmission	$ 30 billion	$ 30 billion	$ 30 billion
Distribution	$ 44 billion	$ 44 billion	$ 44 billion
Onsite Heat Pump Installation	$ 80 billion	$ 120 billion	$ 160 billion
Total	$ 354 billion	$ 514 billion	$ 674 billion

Table 1. Summary of capital costs for full implementation of residential and commercial heat pumps in Massachusetts

The above table shows capital cost figures for three different time horizons. A service life of 30 years is used for the analysis of wind and solar PV generation, transmission and distribution systems. A service life of 10 years is used for battery storage systems, to reflect the limited lifetime of batteries used for daily charge/discharge cycles with depth of discharge (DOD) values in the range of 80 percent. Full battery replacement plus major maintenance/upgrades of charging controls and physical facilities have been presumed at the 10 and 20 year marks. Similarly, an initial service life of 10 years has been used for cold-climate heat pumps that are used for full heating season operation, with major (e.g., compressor/controls) component replacement required at the 10 and 20 year marks. The significant impact on long-term, total capital costs by short-lived equipment components can be seen in the table.

An earlier figure shows that approximately 22.2 million MWh of electricity would be generated per heating season by the described combination offshore wind plus solar PV system. A high fraction of the potential output of the dedicated wind/solar generation capacity necessary for winter heating would be foregone during the summer due to the high ratio of winter-to-summer peak load that would occur due to electrification of heating. A total of approximately 660 million MWh would be produced over the course of 30 years.

The total capital cost of the generation/transmission/distribution cost components would be $514 billion over the described 30 year time horizon. The corresponding energy supply cost for the described wind/solar generation system can be calculated as the $514 billion total capital cost divided by the 660 million MWh of generation over the same 30 year time horizon. The resulting marginal cost of infrastructure for electricity generation/transmission/distribution would thus be approximately $780 per MWh or 78 cents per kWh. Utility costs for administration, operations, taxes, etc., would be additional.

There are two principles of significance to note in this analysis. First, battery storage is conspicuous as an expensive component of the total capital cost for a renewable power-heat pump concept for the residential and commercial building sectors. Battery storage systems are expensive, plus they do not have the same 30 year lifetimes as for generation/transmission/distribution equipment and thus need periodic replacement. Second, the capital cost of the renewable power-heat pump concept suffers from an overall low capacity factor due to the relatively high magnitude of peak loads compared to total

annual energy consumption. Renewable fuels can therefore play a key role in maintaining acceptable cost effectiveness while achieving our environmental goals.

PERFORMANCE OF COLD-CLIMATE AIR-TO-WATER HEAT PUMPS

Air-to-water heat pumps are gaining popularity in the hydronic heating sector. Air-to-water heat pumps are intended to replace fuel-fired hydronic boilers in residential and commercial buildings. Air-to-water heat pumps use refrigeration cycles that are similar to air-to-air heat pumps but face the challenge of having to produce higher temperature output due to the limitations of hydronic distribution systems.

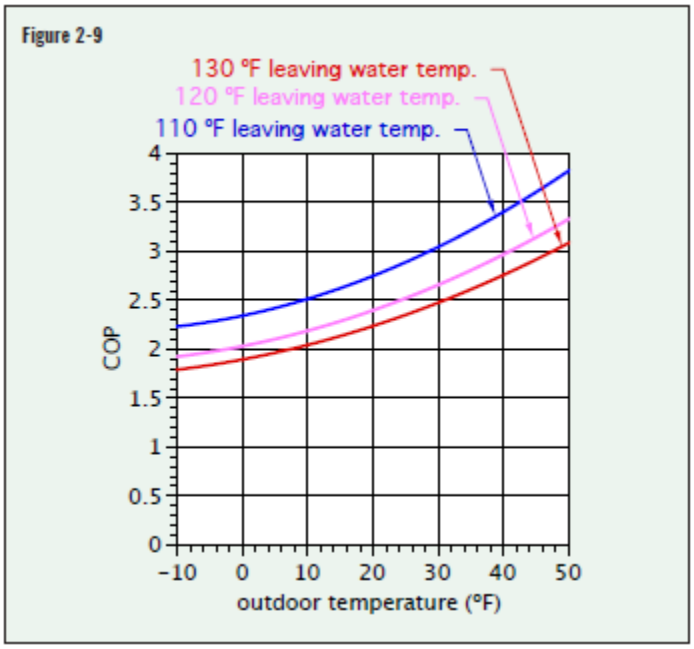


Figure 19. Example Manufacturer COP Rating Chart for Air-to-water Heat Pump

Figure 19 above shows an example COP rating chart from a leading manufacturer of air-to-water heat pumps. The chart shows, for an outdoor temperature of 30 deg F and supply water temperature of 130 deg F, a COP manufacturer rating of about 2.5, which is about 20 percent lower than shown previously in Figure 3 for air-to-air heat pumps at the same outdoor temperature. Such difference in performance significantly impacts the ability of air-to-water heat pumps to accomplish our environmental goals.

NEED FOR HIGHER LEVELS OF RENEWABLE POWER GENERATION BEFORE ELECTRIFICATION CAN ACHIEVE ENVIRONMENTAL BENEFITS

To counter the popular argument that the grid is becoming cleaner, so not to worry about power generation emissions due to heat pumps installed now, the next graph below shows the results of the EPA AVERT program relating to the year 2030 scenario in which 1 million residential heat pumps and 5,000 MW nameplate capacity of offshore wind have been installed in New England.

The fundamental problem is that 5,000 MW nameplate capacity of offshore wind eliminates the need for fossil-based power generation, to meet our present grid loads, on only a handful of days during the

year. The orange slivers on top of the blue bars show the relative extent of wind energy that would be available for operating heat pumps. Any incremental loads such as heat pumps and electric vehicles over the next ten years will continue to simply increase fossil generation loads.

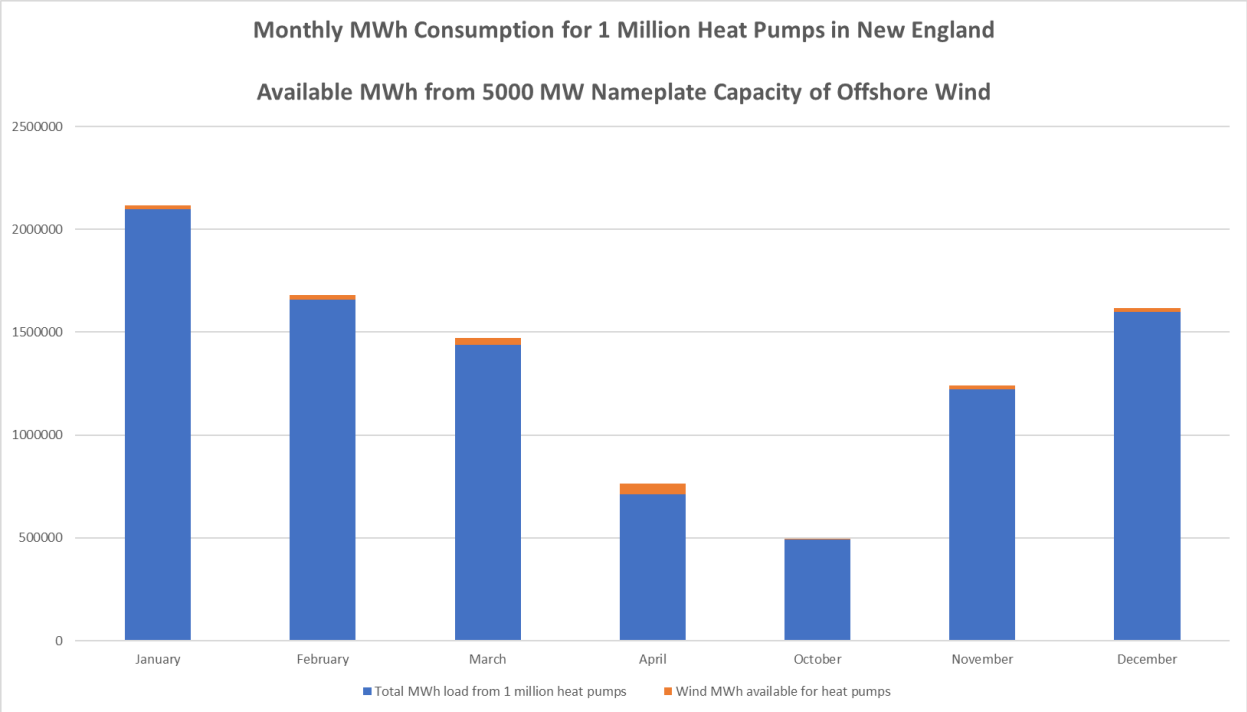


Figure 20. Monthly MWh consumption for 1 million heat pumps in New England with 5000 MW Offshore Wind

The Vineyard/Revolution/Deepwater/Mayflower offshore wind projects planned for the Martha's Vineyard coastal area are jockeying for a limited availability of transmission interconnection at the West Barnstable substation, Canal Electric Station and just a few other prospective grid injection points. Recent ISO New England Planning Advisory Committee deliberations have been consumed by the technical challenges, including voltage/frequency stability problems, of integrating offshore wind into the southeast Massachusetts grid. Even if transmission limitations are resolved, the wind projects planned for the next 10 years, even if fully developed, will be insufficient to eliminate fossil generation, except during a very few hours. Thus, any intentional grid load additions for heat pumps or electric vehicles will have to be met with fossil generation.

The result will be that most heat pumps installed today, if fully utilized for heating thus dealing with a service life of just 10 years or so, will not achieve a single molecule of CO2 reduction compared to B50 biodiesel blends, while incurring huge capital costs and exerting upward pressure on electricity rates.

IMPACT OF HEAT PUMPS ON ELECTRICITY RATES

When cold weather comes to New England, and as grid loads climb, the cost and carbon intensity of power generation at the margin, produced to meet thermal loads, increase as older equipment comes on line and less environmentally-friendly fuels, such as coal and no. 6 residual oil, are used. Market clearing prices for wholesale power in the ISO New England control region are set by the last generation plant to clear hourly Day Ahead or Real-time auctions, with the last plant, by definition, having the highest bid price. The corresponding wholesale power rate in $/MWh, attributed to the generation plant at the margin, is then paid to all operating generators within the control region. This means that the total cost of power to customers is set by the most expensive generators to clear the auctions, which means higher electricity costs for everybody when the New England grid is under stress.

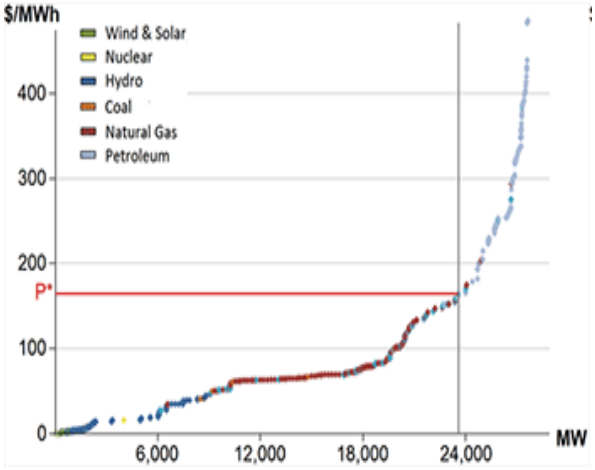


Figure 21. Example ISO New England Price Curve ($ per MWh) vs. Grid Load (MW)

The above graph shows an example curve of $/MWh cost versus MW of grid load within the ISO New England control region. It shows wind, hydro and solar PV power, then nuclear power, as providing the bulk of power up to a level of 6,000 to 9,000 MW. Natural gas-fired, combined cycle systems provide much of the output in the range of 9,000 to about 15,000 MW and lower efficiency, steam-cycle and simple-cycle turbine generators then pick up the remainder of grid load. The graph shows that it is possible to double the wholesale price for power supply by adding just a few thousand MW of grid load.

For each 1 million homes converted to heat pumps, approximately 6,000 MW of additional grid load would occur during cold weather. It is understood that many policymakers are seeking to achieve a fully renewable power grid with no further use of fossil fuels. But until the ISO New England grid achieves renewable generation at the margin, which is several decades over the horizon, fuels will need to be used to produce power for electrically-driven heat pumps, which add to the already sharp peak load characteristics of the grid. The high cost of operation for antiquated generation equipment using non-renewable fuels will translate into continuing higher power costs for all ratepayers.

The onsite use of renewable fuels, instead of heat pumps, for thermal applications in residential and commercial buildings, will provide relief to the ISO New England grid, especially during peak load periods, with significant cost savings to all ratepayers. For the short term, renewable fuels need to be used in sufficient quantity to drive ISO New England grid demand down to the level that can be served

by combined-cycle power plants, rather than steam-cycle or simple-cycle turbine facilities. For the long-term, renewable fuels need to be used to eliminate the use of fossil fuel-fired generation at the margin.

The economy-wide, cost savings attributable to the capping of peak wholesale power rates will depend on the relative growth of solar/wind generation resources compared to the grid demand increase caused by electrification of the buildings and transportation sectors. Especially if heat pump-driven grid demand starts to grow more rapidly than might be offset by new offshore wind power production, it is reasonable to infer from the ISO New England price graph that an avoided cost savings of $30 per MWh of real-time grid load could be achieved during the winter season through the use of biodiesel instead of heat pumps. All electricity customers would benefit from such grid load reduction due to the resulting drop in the wholesale price of electricity by the previously described $30 per MWh.

ISO New England Forward Capacity Market cost savings would also be achieved by the use of biodiesel, since ISO New England will become a winter peaking grid after approximately 1 million residential living units have converted to heat pumps. At a market rate of approximately $5 per kW/month for ISO New England, and based on an average peak heat pump demand of about 6 kW per living unit, the annual cost of additional generation capacity would be in the range of about $360 per living unit.

Air Quality Benefits of Biodiesel - NOx Impact Compared to Electric Heat Pumps

Biodiesel blended with heating oil can reduce emissions that are harmful to human health and the environment. These include direct reductions in particulate matter, sulfur oxides, nitrogen oxides, carbon monoxide, aromatic hydrocarbons, and lifecycle reduction for carbon dioxide and equivalent greenhouse gases. Emission benefits increase with the percentage of biodiesel from 5% (B5), 10% (B10), and 20% (B20), and are meaningful even at low blend levels.

Carbon Dioxide (CO_2): 100% biodiesel reduces lifecycle greenhouse gases (primarily CO_2) by 81%[12]. The corresponding reductions for B5, B10 and B20 blends of biodiesel would be 4%, 8%, and 16%, respectively. Carbon reductions on the order of 80% can be achieved by B100 currently with further improvements expected as processing incorporates higher efficiency and utilization of renewable-based methanol and electricity input.

Nitrogen Oxides (NO_X): Study results vary as nitrogen oxide emissions vary with the type of appliance as well as the blend of biodiesel. For residential space heating equipment, typical biodiesel blends (up to B20) can produce NOx reductions between 5 and 7.5%. Commercial boilers using higher blends can reduce NOx by as much as 35% using B100[3].

---

[1] Weighted average computed by NBB using 2015 EIA and US EPA EMTS feedstock data and the latest published studies on feedstock-specific lifecycle analysis. http://www.eia.gov/biofuels/biodiesel/production/

[2] Pradhan, Shrestha, Van Gerpen, McAloon, Yee, Haas, Duffield; Reassessment of Life Cycle Greenhouse Gas Emissions for Soybean Biodiesel; American Society of Agricultural and Biological Engineers; 2012; http://www.researchgate.net/publication/234143981_Reassessment_of_Life_Cycle_Greenhouse_Gas_Emissions_for_Soybean_Biodiesel/file/d912f51234a621f896.pdf

[3] Krishna, Biodiesel Blends in Space Heating Equipment; Brookhaven National Laboratory; NREL/SR-510-33579; 2004

The table below shows NOx emission factors (lbs per MMBTU of delivered heat) for Bioheat-fired boilers and for cold-climate heat pumps driven by several common configurations of power generation with and without emissions controls. The table shows typical values for both steady-state and peaking operation.

Biodiesel-fired Boilers and Electric Heat Pumps
Typical NOx Emission Factors lbs per MMBTU Delivered Heat

PHOTO A. A B100-fired boiler in a Brookhaven National Laboratory testing facility.

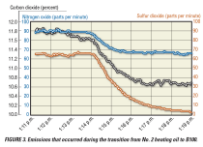


FIGURE 3. Emissions that occurred during the transition from No. 2 heating oil to B100.

	Steady-state	4 hr Peak Load
Combined Cycle w/SCR and OC (5 ppm @ 15% O2)	0.02 lb per MMBTU	0.15 lb per MMBTU
Combustion Turbine w/SCR and OC (5 ppm @ 15% O2)	0.03 lb per MMBTU	0.25 lb per MMBTU
B20 – B100 Boiler (<100 ppm @ 3% O2)	0.10 lb per MMBTU	0.10 lb per MMBTU
Combustion Turbine w/DLN or H2O (30 ppm @ 15% O2)	0.16 lb per MMBTU	0.25 lb per MMBTU
Steam Cycle Gas/Oil (200 ppm @ 3% O2)	0.25 lb per MMBTU	0.30 lb per MMBTU
Combustion Turbine w/o emissions control (150 ppm @ 15% O2)	0.80 lb per MMBTU	1.00 lb per MMBTU

Figure 22. Typical NOx Emission Factors for Residential and Commercial Boilers and Heat Pumps

Although combined-cycle and simple cycle combustion turbine systems with SCR and OC emission control can indeed produce lower levels of hourly NOx emissions than direct-fired combustion systems during off-peak steady-state operation, it must be remembered that most thermal loads occur during either morning/evening peak periods or during cold weather when peaking operation becomes dominant for power generation at the margin. Under peak load conditions, the direct combustion of B20 to B100 blends show the lowest level of NOx emission factors among the options shown.

Heat pump operation during winter peak periods can thus frequently result in higher total NOx emissions than individual fuel-fired heating systems. One 350 MW combined-cycle unit (e.g., GE Series 7 HA Frame with HRSG) could heat 60,000 homes via cold-climate heat pumps but would emit NOx equal to about 120,000 natural gas/Bioheat-fired home heating systems during a 2 hour start-up period from cold or lukewarm generator status. The low-level area source of NOx associated with the direct combustion of biodiesel blends would then be concentrated into a major point source that falls under US EPA Title 5 Clean Air Act emissions standards. Possible environmental justice concerns would result due to high local emissions in low-income neighborhoods adjacent to power plants.

MassDEP and MADOER should perform a comprehensive analysis of power generation in Massachusetts and consider the imposition of requirements for NOx offset projects to mitigate negative air quality impacts in economically disadvantaged neighborhoods adjacent to power plants.

APPENDIX

NEED FOR USE OF MARGINAL EMISSIONS FACTORS FOR POWER GENERATION

On the Importance of Marginal Emissions Factors for Policy Analysis

Environmental nonprofits WattTime and Rocky Mountain Institute recommend marginal rather than average emissions factors be used for analysis of policies whose goal is to reduce carbon emissions. This primer explains why.

The purpose of average emissions factors is to apportion environmental responsibility.

A common technique in environmental analysis is to divide responsibility for cleaning up pollution equally between the different actors in a power grid on the basis of their relative power consumption. For example, if a given city consumes 5% of all the electricity produced in a given power grid, it is simple and intuitive to call it responsible for 5% of all the emissions in that grid.

The virtue of this technique is its simplicity. Each city or company on a power grid can simply calculate the average emissions per each kilowatt-hour on its local power grid; measure its own kilowatt-hours consumed; and multiply to determine its "share" of a given grid's pollution.[1]

Average emissions factors should *not* be used to measure environmental impact.

Historically, average emissions rates have been a convenient way to apportion "ownership" of different organizations' responsibility for emissions. Unfortunately, as momentum builds for institutions to more actively manage emissions, a worrisome trend is the growing number of organizations mis-applying average emissions factors to estimate the impact of environmental decisions. Yet this approach does not accurately measure environmental consequences. Returning to the previous example, it's entirely possible that the exact 5% of the grid's electricity that city is consuming comes predominantly from aging natural gas power plants, which would mean comparatively high emissions.

The correct way to measure environmental impact is using marginal emissions factors.

To protect against this mistake, the correct way to measure the impact of environmental decisions is to use *marginal* emissions factors.[2] Marginal emissions factors measure the actual environmental consequences of taking different potential actions on the power grid.

If the example city is evaluating an energy efficiency measure to conserve one megawatt-hour of electricity consumption, this program will reduce local emissions by reducing output at one or more power plants. But *which* power plants? Many sources of power, for example most solar panels, are designed to send all the energy they can to the power grid no matter the level of energy demand. Thus, they will be completely unaffected.

---

[1] See, e.g. the GHG Protocol Corporate Standard.

[2] See, e.g. the GHG Protocol for Grid-Connected Electricity Projects.

Conserving energy only affects some power plants: those which can scale up or down in response, known as the "marginal" power plants. Marginal emissions measure the emissions per kilowatt-hour only from these power plants, thus accurately measuring real-world results.

Why using average emissions can lead to incorrect policy conclusions.

When a power grid experiences a change in energy demand—for example, adding electric vehicles, or installing new clean power—that changes the emissions from local power plants. But some power plants are completely unaffected, for example, most solar panels and nuclear plants.

Using average emissions factors to measure the effect of environmental decisions implicitly assumes that energy policy-making affects all power plants equally. This overestimates the effects on these unaffected plants, and underestimates the effects on the marginal plants which actually do change in response to policy. If these plants have different emissions rates, this can lead to incorrect measurement of policies.

This is a growing problem because the more "always-on" clean energy a region installs, the more inaccurate any analyses using average emissions factors become. For example, on Friday May 3rd, 2019 at 1:30 PM, the CAISO website reported the following data regarding real-time energy supply and emissions. CAISO was delivering 23, 690 MW of power at an emissions rate of 3,042 $mTCO_2$/hour. Nearly 50% of the total supply (12,086 MW), was from renewable sources. Using an approach of average emissions, one would say that the current emissions rate was 283lbs CO_2/MWh.[3]

However, the marginal emissions rate for the same time was much higher, at 927 lbs CO_2/MWh. Despite the high penetration of midday solar, if 1 MWh of load was added to the grid at this time, the solar plants would likely not be the type of fuel responding to the increased load. It is more likely that an inefficient gas generator would ramp to meet the increased load, thus creating an emissions impact of 927 lbs of CO_2.[4]

As seen here, true emissions rates can be up to four times higher than average emissions-based estimates would imply, with major consequences for policy evaluation.

If policymakers were to only allow technologies that were below the average emissions levels, they might inadvertently allow existing, inefficient generators to operate more than they intend. The result would be restricting projects are that good for the environment, instead of encouraging them.

[3] California ISO real-time energy data.
[4] WattTime marginal emissions data.

Common situations in which marginal emissions is most important.

Marginal emission factors should nearly always be used in environmental impact analysis. Leading researchers apply them when measuring everything from renewable energy, to electric vehicles, to energy storage.[5] But they have particular importance for public policy whenever a policy measure is comparing different options, for example:

- *Comparing what times are best to use or store energy*. Marginal emissions should be used to select which times are cleanest, such as for energy storage.[6]
- *Comparing where is best to site a new energy asset*. Marginal emission rates should be used to measure the impact of new renewable energy, particularly in selecting locations.[7]
- *Evaluating electrification*. Marginal emissions rates should be used when evaluating the environmental impact of electrifying fossil fuel technologies such as vehicles, water heaters, and appliances. For example, in some coal-heavy regions, switching from a gasoline-powered car to an electric vehicle can actually increase, not decrease emissions.
- *Evaluating low-emissions energy sources*. Marginal emissions rates should be used to evaluate the environmental impact of low-pollution electricity generation technologies such as fuel cells and biomass. These technologies are sometimes mistakenly thought to increase emissions if they emit more than the local average emissions rate. But in reality they reduce emissions anywhere they less than the local marginal emissions rate.

For more information about average vs. marginal emissions, see this joint WattTime-RMI post.

How to properly design policy based on data-driven marginal emissions rates

Several large, influential public agencies (the CPUC), and private customers are committed to accurately reducing carbon emissions by using marginal emissions analysis. In December of 2018, the CPUC staff released a draft regulation directing the commission to require entities utilizing public incentives in the Self Generation Incentive Program (SGIP) to use marginal emissions rates to determine the net GHG impact of their project.[8]

Creating effective regulations and policy, as the CPUC has done, requires thorough data analysis and stakeholder engagement. As an independent, third-party non-profit, WattTime was founded to guide policy makers and regulators through this process to ensure that their efforts accurately reduce greenhouse gas emissions.

---

[5] See, e.g. Hittinger and Azevedo (2015), Callaway et al (2017) or Fares and Weber (2017).
[6] E.g. the California Public Utilities Commission's decision to use marginal emissions in real time for energy storage.
[7] See, e.g. Boston University's recent decision to buy renewable energy outside Boston using marginal emissions.

May 1, 2023

Bonnie Heiple, Commissioner
Massachusetts Department of Environmental Protection
100 Cambridge Street, Suite 900
Boston, MA 02114

Initial Stakeholder Input on the Role of Renewable Gas in a Massachusetts Clean Heat Standard

Dear Commissioner Heiple,

The Coalition for Renewable Natural Gas (RNG Coalition) submits the following comments for consideration by the Massachusetts Department of Environmental Protection (DEP) and other stakeholders of the forthcoming Clean Heat Standard (CHS) development process, aimed reducing greenhouse gas emissions from fossil heating fuels in the Commonwealth.[1]

A CHS program represents an important opportunity to incent the full suite of technologies need to fully decarbonize Massachusetts' thermal energy load in line with the ambitious climate and environmental goals put forth by the Global Warming Solutions Act.[2] Importantly, the increased use of waste-derived renewable gases (e.g., renewable natural gas and renewable hydrogen) would serve as a climate change mitigation tool for use across all sectors by increasing clean fuel supply; capture and utilization of methane emissions from organic waste streams; and circularity in Massachusetts' economy through recycling, the creation of bioproducts, and carbon sequestration.

RNG Coalition's goal in this filing is to provide an overview the long-standing, science-based conclusions regarding the impact of biogas and renewable natural gas (RNG); aggregate and describe the role of renewable gas as concluded by jurisdictions and organizations leading on climate change policy; and to outline a fact-based role for renewable gas based on these conclusions. We hope that the following comments from our Coalition will support Massachusetts' efforts in outlining a comprehensive vision for the near- and long-term sustainable production and use of renewable gases as a key part of the Commonwealth's CHS.

Sincerely,

/s/

Sam Lehr
Manager of Sustainability and Markets Policy
Coalition for Renewable Natural Gas

[1] https://www.mass.gov/info-details/massachusetts-clean-heat-standard#contact
[2] https://www.mass.gov/service-details/global-warming-solutions-act-background

1017 L Street #513
Sacramento, CA 95814
(302) 757-0866
Sam.lehr@rngcoalition.com

Table of Contents

Renewable Gas is a Fundamental Part of the Solution to Climate Change

The Role of Renewable Gas in Decarbonization

Renewable gases, including RNG[3] and renewable hydrogen, are an important near-term decarbonization strategy for all applications which currently utilize fossil-derived fuels and, in the long-term, renewable gas use will be necessary in applications that have certain reliability requirements, or which are not well-suited to electrification.[4]

Incorporating the use of renewable gases as part of Massachusetts' climate change mitigation strategy will result in compound benefits through (1) the displacement of anthropogenic carbon dioxide (CO_2) emissions from the combustion of fossil fuels, (2) the critical near-term greenhouse gas (GHG) benefits of increased methane capture and destruction, and (3) additional environmental benefits that result from the improved management of organic waste.

To achieve these outcomes, Massachusetts should target the development of renewable gases in tandem with the other technologies that will be required to fully decarbonize the Commonwealth.[5] RNG should be given significant attention in the near-term, based on both the well-proven technology readiness level of various methods of making RNG today—such as Anerobic Digestion (AD)—and the flexibility provided by RNG's fungibility with all conventional gas applications.

In the mid- to long-term, hydrogen produced from renewable feedstocks such as clean electricity and waste biomass should also be viewed as an essential part of Massachusetts' renewable gas mix. In a similar manner to RNG, waste-biomass-derived hydrogen is poised to contribute to Massachusetts' circular bioeconomy as a pathway for recycling resources which are not suitable for AD. Furthermore, the use of carbon capture and sequestration (CCS) technologies such as geologic storage or biochar will produce negative-GHG outcomes when paired with RNG and hydrogen derived from waste biomass. These technologies will provide a necessary pathway to *remove* emissions from the atmosphere,[6] creating an important pathway to carbon neutrality and, ultimately, carbon negativity.

---

[3] Sometimes called biomethane or refined biogas.

[4] Bataille et al., *A Review of Technology and Policy Deep Decarbonization Pathway Options for Making Energy-Intensive Industry Production Consistent with the Paris Agreement.* https://www.sciencedirect.com/science/article/abs/pii/S0959652618307686

[5] Including, for example, end-use electrification and geothermal resources. RNG Coalition does not oppose electrification or deployment of any other low-GHG technology.

[6] Sequestration of the biogenic carbon contained in waste feedstocks from RNG and biomass-derived renewable hydrogen can be a carbon-negative process that removes carbon from the atmosphere. This benefit is separate from the methane destruction potential of RNG, which can lead to additional carbon-negative outcomes on a lifecycle basis relative to existing environmental control baselines.

Over time, these resources can be directed toward the end-uses which are best served by the use of gaseous fuels, serving in tandem with technologies that require time to scale and achieve production cost reductions (e.g., electrolytic hydrogen, heavy duty electric vehicles) or that involve the turnover of long-lived capital stock (e.g., electrification of building space and water heating).

The portion of renewable gas serving Massachusetts' gas system will increase even as total system throughput declines, eventually leading to a smaller gas system which transports only 100% clean fuels[7] to targeted end uses. Given expected declines in gas system throughput, the use of renewable gas need not lead to net pipeline expansion, beyond connecting these new supply sources to existing load.

Further, many long-term studies of decarbonization agree that the use of renewable gases is essential but disagree about which sector will most need RNG to decarbonize in the long run.[8] Because of these facts, in these comments we attempt to articulate a nimble vision of how RNG in Massachusetts can best help with decarbonization in the near-, mid-, and long-terms as shown in Figure 1.

Figure 1. Priorities for RNG Deployment Will Likely (and Should) Shift Over Time

Navigating these complex but necessary changes will require state agencies, utilities, and other stakeholders to fully consider all possible renewable gas end-uses in the near-term, and to develop a framework to determine what end-uses may be most appropriate in the mid- to long-term. As outlined below, based on existing policies and consensus surrounding gas

[7] https://www.nationalgrid.com/document/146251/download

[8] WRI 2020, Renewable Natural Gas as a Climate Strategy: Guidance for State Policymakers https://static1.squarespace.com/static/53a09c47e4b050b5ad5bf4f5/t/60ad57a35aaa6563fbc3e508/1621972901032/2020_Dec+World+Resources+Institute_Renewable-natural-gas-climate-strategy.pdf

decarbonization strategy in other jurisdictions, we believe that the forthcoming CHS development process will serve as an important step toward achieving this outcome.

Reducing Methane Emissions and Improving Organic Waste Management

Complementary to their role as a method of zero-fossil-carbon energy supply, RNG and other waste-derived resources are unique in their near-term ability to reduce methane—a short-lived climate pollutant that, when assessed over a 20-year timeframe, is up to 80 times as potent as a greenhouse gas as carbon dioxide[9]—and to serve as a catalyst for improving organic waste management practices.

Society's waste streams create significant methane that must be dealt with quickly. Using this methane from organic wastes productively as a resource, rather than flaring it, provides greater impetus toward implementing and improving methane capture and organic waste management systems. The need to target methane emissions immediately as part of any GHG reduction strategy is substantiated by leading organizations focused on climate change mitigation, including the Intergovernmental Panel on Climate Change (IPCC), as described below.

As shown in Figure 2, comparing the International Energy Agency's (IEA) estimated cost of reducing methane emissions through the creation of RNG[10] to the Social Cost of Carbon (SCC) assessed by New York,[11] RNG is likely to be a cost-effective GHG reduction strategy. In this example, New York serves as a helpful comparison for Massachusetts being the only neighboring state with similar diversity in urban and rural areas that has developed a SCC.[12] However, there is reason to believe that New York's SCC estimate may undervalue the benefits of GHG reduction. A recent article published in *Nature* provides a preferred mean estimate of $185 per ton of CO_2, which takes into account recommendations from the National Academies of Sciences, Engineering, and Medicine.[13]

Inclusion of methane reduction benefits in such a calculation is important. Factoring methane capture and destruction into the lifecycle GHG impact shows the true cost-effectiveness of RNG facilities, even using a 100-year GWP. Comparatively, using a 20-year GWP, which is more consistent with the timeframe under which we must reduce GHG emissions to address climate

[9] The Global Warming Potential for non-fossil methane is 27 on a 100-year basis and 80 on a 20-year basis according to the most recent IPCC assessment. See Table 7.15 directly from Chapter 7.6 of the Sixth Assessment Report (Working Group 1: The Physical Science Basis). https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07.pdf

[10] https://iea.blob.core.windows.net/assets/03aeb10c-c38c-4d10-bcec-de92e9ab815f/Outlook_for_biogas_and_biomethane.pdf

[11] New York estimates that the societal benefit of reducing one ton of carbon dioxide is $125 per ton (lower central discount rate, for a 2020 reduction): https://www.dec.ny.gov/regulations/56552.html

[12] https://costofcarbon.org/states

[13] Rennert et Al, *Comprehensive Evidence Implies a Higher Social Cost of CO_2* https://www.nature.com/articles/s41586-022-05224-9

change,[14] would further and significantly increase this cost effectiveness given the outsized impact of addressing methane emissions.

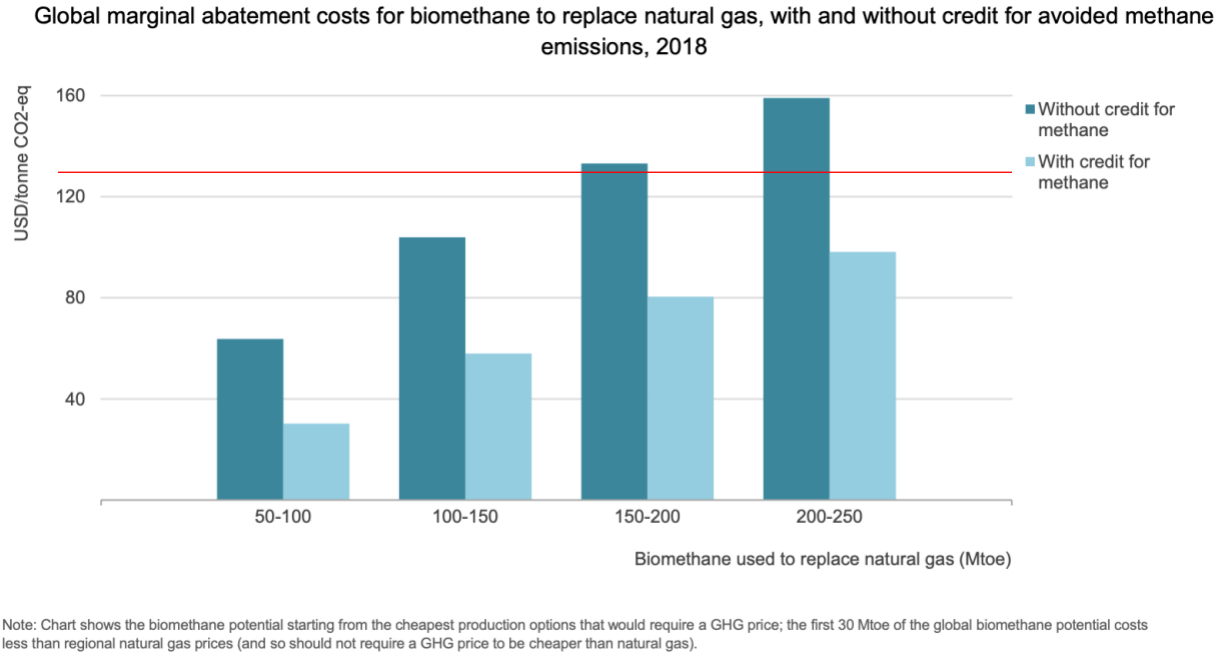


Figure 2. Comparing the IEA's Biomethane Abatement Costs to New York's Social Cost of Carbon (red line), most RNG is cost effective even using 100-year GWPs. Recognizing methane benefits (especially if using 20-year GWP) helps improve cost effectiveness further.

In creating a policy framework designed to improve the GHG performance of the organic waste sector it is important to consider that, globally, municipal solid waste is expected to grow 69% from 2.01 billion metric tons in 2018 to 3.4 BT in 2050 (around 50% of which is organic waste).[15] Moreover, these trends are underpinned by an expected 25% population increase of 2 billion people between now and 2050.[16] Considering the Commonwealth's ambitious GHG reduction goals, Massachusetts needs to help pioneer the development and commercial deployment of viable technologies to address these challenges.

The Food Recovery Hierarchy developed by the United States Environmental Protection Agency (U.S. EPA), which ranks industrial use—inclusive of conversion to energy through anaerobic digestion—as the 4th highest use after source reduction and repurposing edible food to humans and animals.[17]

---

[14] Sam Abernethy and Robert B Jackson, *Global Temperature Goals Should Determine the Time Horizons for Greenhouse Gas Emission Metrics*, 2022 Environ. Res. Lett. 17 024019 https://iopscience.iop.org/article/10.1088/1748-9326/ac4940/pdf

[15] https://datatopics.worldbank.org/what-a-waste/trends_in_solid_waste_management.html

[16] https://www.un.org/development/desa/en/news/population/world-population-prospects-2019.html

[17] https://www.epa.gov/sustainable-management-food/food-recovery-hierarchy

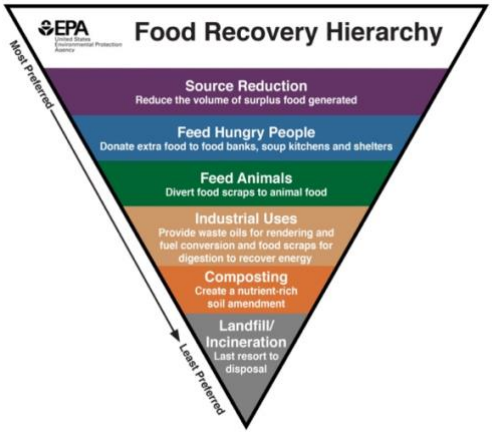


Figure 3. U.S. EPA Food Recovery Hierarchy

RNG production through anaerobic digestion of materials such as food waste, animal manure, and wastewater also yields valuable by-products. After the elimination of pathogens, digested solids can be recycled for productive uses such as animal bedding,[18] and AD converts nutrients into a form more accessible by plants than raw manure, allowing for an effective organic fertilizer.[19] Processing digestate using pyrolysis and other technologies to create biochar is also an option, resulting in a soil amendment which supports plant growth, can eliminate harmful perfluoroalkyl and polyfluoroalkyl substances (PFAS), and can achieve carbon-negative outcomes. Overall, recycling and using the by-products of waste through AD for RNG production processes creates a more environmentally responsible and sustainable circular economy.

In developing its CHS, Massachusetts should consider the benefits of replacing geologic natural gas, utilizing existing natural gas infrastructure, and the long-term need for gaseous thermal resources in certain sectors. Furthermore, stakeholders must be clear as to what policies or strategies will be used to promote methane capture from these sources if RNG is not incented. Simply requiring organic waste aggregators to capture and flare emissions is not a good outcome from a local criteria pollutant perspective, and will not incent methane capture to the fullest extent possible. Studies from both U.S. EPA[20] and the California Air Resources Board (CARB)[21] have shown that pipeline injection of biomethane reduces criteria air pollutants both on site (relative to a case where the biogas is flared or used in most on-site power generation equipment) and on a lifecycle basis (with additional emission reductions possible depending on end use).[22]

---

[18] U.S. EPA. *The Benefits of Anaerobic Digestion* (2020, August 18) https://www.epa.gov/agstar/benefits-anaerobic-digestion

[19] Id.

[20] https://nepis.epa.gov/Exe/ZyPDF.cgi/P100QCXZ.PDF?Dockey=P100QCXZ.PDF

[21] https://ww2.arb.ca.gov/sites/default/files/2020-07/dairy-emissions-matrix-113018.pdf

[22] For example, when low-NOx natural gas vehicles displace emissions from diesel vehicles.

RNG Supply Potential

Based on a 2019 study conducted by ICF which outlines the supply potential for RNG in the United States,[23] we estimate that RNG from AD feedstocks will be able to supply at least 1,425.3 tBtu/year by 2040.[24] Based on U.S. natural gas consumption in 2021, this would cover approximately 30.6% of residential demand, 43.7% of commercial demand, or 17.4% of industrial demand nationally.[25]

Extensive capital stock exists in Massachusetts that is designed to transport and consume gaseous fuels, and which possesses a significant remaining useful life. Conventional natural gas is currently Massachusetts' largest single source of energy, accounting for 31.3% of total energy consumption in the state—including 30% of commercial sector use, 33% of industrial sector use, and 29% of residential use.[26] ICF estimates that Massachusetts' potential to produce RNG from anaerobic digestion sources (landfills, animal manure, wastewater treatment, and food waste) is on the order of 7.2-11.824 tBtu/year.[27] This supply potential could satisfy 10% of residential demand, 11% of commercial demand, or 26% of industrial demand.

Although the RNG industry's focus has traditionally been limited to feedstocks which are well-suited to AD, it is also important to consider the additional potential of RNG produced via gasification of feedstocks such as agricultural residue, forestry and forest product residue, and energy crops. According to the ICF study, New England's gasification feedstocks (excluding MSW) have the potential to add 7.9 tBtu/yr to RNG supply.[28]

Although gasification/pyrolysis feedstocks do not have the benefit of capturing and reducing methane emissions, potential benefits incentivizing the improved management of these feedstock streams deserves additional attention. In California, for example, the recently enacted RNG mandate requires the development of pilot gasification facilities for forestry waste as a wildfire control mechanism. Furthermore, potential energy crops should not be dismissed without additional analysis on a feedstock-by-feedstock basis. Research by the Climate and Applied Forest Research Institute at the State University of New York's College of

---

[23] ICF, *Renewable Sources of Natural Gas: Supply and Emissions Reduction Assessment.*

https://gasfoundation.org/wp-content/uploads/2019/12/AGF-2019-RNG-Study-Full-Report-FINAL-12-18-19.pdf

[24] Based conservatively on the "High" production scenario, using landfill gas, animal manure, wastewater, and food waste feedstocks.

[25] https://www.eia.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm

[26] EIA estimates Massachusetts' 2020 total energy consumption by type here, 2020 commercial and industrial energy consumption here, and 2020 total natural gas use by sector here. Note that values are approximate due to variations between data sets.

[27] American Gas Foundation, *Renewable Sources of Natural Gas: Supply and Emissions Reduction Assessment*, 2019 https://gasfoundation.org/wp-content/uploads/2019/12/AGF-2019-RNG-Study-Full-Report-FINAL-12-18-19.pdf

[28] In the "High" scenario, representing the middle resource availability case, pg. 20.

Environmental Science and Forestry,[29] suggests that feedstocks such as willow can sequester more carbon in the soil than emitted over the plants' lifetime, potentially leading to carbon-negative outcomes even before the employment of CCS. Despite the need for more caution with gasification/pyrolysis feedstocks,[30] if incentivized carefully these resources have the potential to drive numerous environmentally beneficial outcomes throughout Massachusetts' and New England's bioeconomy.

Finally, when determining the total potential for RNG in Massachusetts, DPU should consider using the Commonwealth's population-weighted share of regional RNG resources that could be imported. Massachusetts' gas demand is currently served by pipelines which transport conventional natural gas, extracted in other states, many miles. While some parts of the gas infrastructure are slated to decline, these larger transport arteries will need to be maintained to support fossil natural gas use for some time, and could eventually transport 100% clean fuels as part of a smaller gas system. For example, ICF estimates that nationally, in a "High" production scenario, states east of the Mississippi River[31] could produce 756.1 tBtu/y from AD feedstocks and 582.1 tBtu/y from gasification feedstocks (excluding MSW) in 2040.

Studies and Existing Programs Highlighting Capturing Methane from Organic Wastes Streams with Productive Energy Use as a Key Near-term Climate Strategy

The complementarity of RNG and renewable hydrogen with other decarbonization strategies—such as electrification and energy efficiency—is well-substantiated by climate change mitigation studies and strategies conducted in various states, as well as by leading universities, government entities, and environmental organizations.

Massachusetts' broader energy and waste decarbonization strategies should include renewable gases in a manner that reflects the most current thinking and best modeling of pathways to reach carbon neutrality by 2050 while also remaining focused on the need to drive substantial near-term GHG reductions. The following are leading examples of studies outlining the role of RNG in economywide decarbonization, all of which substantiate the necessity of including renewable gases in strategies that reach deep GHG cuts.

Intergovernmental Panel on Climate Change

The Intergovernmental Panel on Climate Change (IPCC) calls methane capture and recovery from solid waste management "a short-term 'win-win' policy that simultaneously improves air

[29] http://cafri-ny.org/wp-content/uploads/2021/01/Greenhouse-Gas-Balance-of-Willow.pdf

[30] We understand and appreciate the concerns of environmental groups related to intentionally creating methane through biomass gasification and agree that it is especially important to employ strong lifecycle accounting for such projects to guard against pathways that would produce a high-carbon outcome.

[31] Including the New England, Middle Atlantic, South Atlantic, East North Central, and East South Central regions.

quality and limits climate change."[32] Furthermore, the 2021 IPCC Working Group I report recommends that "strong, rapid, and sustained reductions in CH_4 emissions" should be a first priority for policymakers.[33]

In its most recent approved draft report on GHG mitigation, entitled *Climate Change 2022, Working Group III contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change,*[34] the IPCC states that:

> *"Because some applications (e.g., aviation) are not currently amenable to electrification, it is anticipated that 100% renewable energy systems will need to include alternative fuels such as hydrogen or biofuels."* Page TS-54
>
> *"Several biomass conversion technologies can generate co-benefits for land and water. Anaerobic digestion of organic wastes (e.g., food waste, manure) produces a nutrient-rich digestate and biogas that can be utilised for heating and cooking or upgraded for use in electricity generation, industrial processes, or as transportation fuel. The digestate is a rich source of nitrogen, phosphorus and other plant nutrients, and its application to farmland returns exported nutrients as well as carbon."* Page 12-102, line 36 (citations removed)
>
> *"Scaling up bioenergy use will require advanced technologies such as gasification, Fischer-Tropsch processing, hydrothermal liquefaction (HTL), and pyrolysis. These pathways could deliver several final energy carriers starting from multiple feedstocks, including forest biomass, dedicated cellulosic feedstocks, crop residues, and wastes."* Page 6-40, line 7
>
> *"Most production routes for biofuels, biochemicals and biogas generate large side streams of concentrated CO_2 which is easily captured, and which could become a source of negative emissions."* Page 11-32, line 12

Environmental Protection Agency

The U.S. EPA has long supported biogas recovery for use as RNG under programs such as the Landfill Methane Outreach Program (LMOP),[35] AgSTAR,[36] and the Renewable Fuel Standard.[37]

---

[32] See page 6-91 of: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter_06.pdf

[33] https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf, pg. 27

[34] https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_FinalDraft_FullReport.pdf

[35] https://www.epa.gov/lmop/renewable-natural-gas

[36] https://www.epa.gov/agstar

[37] https://www.epa.gov/renewable-fuel-standard-program

The LMOP website, for example, notes the benefits of RNG as a resource which utilizes existing infrastructure, supports local economies, provides local air quality benefits compared to fossil fuel resources such as diesel and conventional natural gas, and reduces GHG emissions through methane destruction and fossil fuel displacement. In the agricultural sector AgSTAR has, for more than 20 years, promoted covered lagoons and digesters as the top solutions for manure management.[38] More recently, EPA added Renewable Natural Gas as an explicit opportunity within the Methane Challenge program, noting that, "as a substitute for natural gas, RNG has many end-uses, including in thermal applications, to generate electricity, for vehicle fuel, or as a bio-product feedstock."[39]

Canada

Canada has made several climate commitments backed by concrete plans and policies. They have stated that:

> *"To meet our new 2030 and 2050 net-zero goals, Canada's economy will need to be powered by two equally important energy sources—clean power and clean fuels. Electrification—clean power—provides a near-term pathway for emissions reductions in many sectors including personal transport and the built environment. But clean fuels (low-carbon fuels that typically consist of clean hydrogen, advanced biofuels, liquid synthetic fuels, and renewable natural gas) are expected to play a critical role in 'hard-to-decarbonize' sectors such as industry and medium- and heavy-duty freight.*
>
> *Even in a scenario with ambitious electrification, it is estimated that 60 percent or more of national energy demand in 2050 could need to be met with clean fuels to meet a net-zero goal."*[40]

In its 2030 Emissions Reduction Plan released on March 29, 2022, the Government of Canada adds that economy-wide strategies to reduce GHG emissions, inclusive of clean fuels and methane emissions reduction, will enable Canada to meet its climate targets in the most flexible and cost-effective way.[41]

Canada also has strong methane emission reduction targets. In November 2021, Canada joined the Global Methane Pledge, which has been signed by over 100 countries, to reduce anthropogenic methane emissions across all sectors by at least 30% below 2020 levels by 2030. The measures outlined

---

[38] https://www.epa.gov/sites/default/files/2019-09/documents/epa_non-co2_greenhouse_gases_rpt-epa430r19010.pdf

[39] https://www.epa.gov/system/files/documents/2022-05/MC_BMP_TechnicalDocument_2022-05.pdf

[40] Natural Resources Canada, "Clean fuels – fueling the future," 2022. https://www.nrcan.gc.ca/our-natural-resources/energy-sources-distribution/clean-fuels-fueling-the-future/23735

[41] Environment and Climate Change Canada, *2030 Emissions Reduction Plan: Canada's Next Steps for Clean Air and a Strong Economy* (2022), page 23 (pdf page 25). https://www.canada.ca/content/dam/eccc/documents/pdf/climate-change/erp/Canada-2030-Emissions-Reduction-Plan-eng.pdf

in the 2030 Emissions Reduction Plan may result in a reduction in waste-sector GHG emissions of 49% by 2030 against 2005 levels.[42]

European Union and the Danish Gas Strategy

Europe has long supported RNG under the broad Renewable Energy Directive (RED) framework.[43] Recent revisions known as the "Hydrogen and Decarbonized Gas Package"[44] reinforce support for renewable gases as a key greenhouse gas reduction strategy in the context of RED updates and the "Fit for 55"[45] strategy, which is essentially the EU's climate roadmap process.

Individual European Union member states have very high biomethane blend rates. For example, RNG plays a key role in the Danish strategy for processing organic waste and decarbonizing the gas sector, even as many residential and commercial building customers remain connected to the gas load. Indeed, Denmark is targeting widespread building electrification (and is much farther ahead in achieving this goal than American states). The recently published Danish Green Gas Strategy[46] recognizes that converting their gas system to RNG (now at 40% RNG;[47] expected to achieve 100% RNG in the early 2030's) enables more expedient decarbonization than focusing on electrification only. Importantly, the Danish energy strategy's long-term plan for RNG also targets hard-to-decarbonize sectors. Denmark has long been considered a leader in sustainability under a number of metrics, including renewable energy deployment and waste disposal.

Russia's recent military aggression against Ukraine has massively disrupted Europe (and the world's) energy system. It has caused hardship due to high energy prices and it has heightened energy security concerns, bringing to the fore the EU's over-dependence on gas, oil, and coal imports from Russia. As a result, on March 8, 2022, the European Commission called for a rapid phase out of Russian fossil fuels and an acceleration of the European Green Deal in its Communication "REPowerEU: Joint European Action for More Affordable, Secure and Sustainable Energy".[48] This action plan calls for Europe achieving 35 billion cubic meters (bcm) of annual RNG production by 2030. The European Biogas Association states that this target represents over 20% of the current EU gas imports from Russia and that by 2050, this potential

[42] Ibid, page 90 (pdf page 92)

[43] https://www.europeanbiogas.eu/renewable-energy-legislation/#:~:text=In%20general%2C%20the%20Directive%20is,border%20trade%20of%20biomethane%20easier

[44] https://ec.europa.eu/commission/presscorner/detail/en/ip_21_6682

[45] https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-green-transition/

[46] https://ens.dk/sites/ens.dk/files/Naturgas/groen_gasstrategi_en.pdf

[47] https://www.bioenergy-news.com/news/biogas-takes-up-40-of-methane-in-denmarks-natural-gas-grid/?utm_campaign=RAE%20&utm_content=225733188&utm_medium=social&utm_source=linkedin&hss_channel=lcp-3618343

[48] https://ec.europa.eu/commission/presscorner/detail/en/qanda_22_3132

can triple, growing to well over 100 bcm and covering 30-50% of the future EU gas demand.[49] The EU has also joined the Methane Pledge targeting a 30% reduction by 2030.[50]

International Energy Agency

The International Energy Agency's (IEA) *Net Zero by 2050* report from May 2021 projects that, to reach carbon neutrality, global RNG use needs to increase seven times from 2020 levels by 2030 and over 27 times 2020 levels by 2050, leading to a blend rate in gas networks of above 80%. The report also notes that a key advantage of RNG is ability to "use existing natural gas pipelines and end-user equipment",[51] continuing that "[t]he share of low-carbon gases (hydrogen, biomethane, synthetic methane) in gas distributed to buildings rises from almost zero to 10% by 2030 to above 75% by 2050",[52] and that "[g]overnments should prioritise the co-development of biogas upgrading facilities and biomethane injection sites by 2030, ensuring that particular attention is paid to minimizing fugitive biomethane emissions from the supply chain."[53] These statements surrounding the timeline and trajectory for RNG development and use align with our vision for the future of the RNG industry in Massachusetts and North America.

California

In May 2022 the California Air Resources Board (CARB) released their Draft 2022 Scoping Plan,[54] which outlines the state's pathway to carbon neutrality by 2045—one of the most ambitious GHG reduction targets put forth by any jurisdiction in the world. The plan identifies increasing methane capture at landfills and dairy digesters as a key GHG abatement strategy. Specifically, strategies for the dairy and livestock sector include, "[Installing] state of the art anaerobic digesters that maximize air and water quality protection, [maximizing] biomethane capture, and [directing] biomethane to sectors that are hard to decarbonize or as a feedstock for energy".[55] Strategies for reducing methane emissions include, "[maximizing] existing infrastructure and [expanding] it to reduce landfill disposal, with strategies including composting, anaerobic digestion, co-digestion at wastewater treatment plants, and other non-combustion conversion technologies."[56]

---

[49] https://www.bioenergy-news.com/news/biomethane-will-deliver-20-of-current-eu-gas-imports-from-russia-by-2030/

[50] https://www.state.gov/joint-u-s-eu-statement-on-the-global-methane-pledge/

[51] Id., pg. 78

[52] Id., pg. 146

[53] Id., pg. 112

[54] https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents

[55] Id., pg. 214

[56] Id., pg. 216

California's strategy also includes the use of RNG across different sectors. In the buildings sector, for example, "This transition must include the goal of trimming back the existing gas infrastructure so pockets of gas-fueled residential and commercial buildings do not require ongoing maintenance of the entire limb for gas delivery. Blending low-carbon fuels, such as hydrogen and biomethane, into the pipeline further displaces fossil gas".[57] In the industrial sector, "Decarbonizing industrial facilities depends upon displacing fossil fuel use with a mix of electrification, solar thermal heat, biomethane, low- or zero-carbon hydrogen, and other low-carbon fuels to provide energy for heat and reduce combustion emissions".[58] And finally, in the transportation sector, "In addition to building the production and distribution infrastructure for zero-carbon fuels, the state must continue to support low-carbon liquid fuels during this period of transition and for much harder sectors for ZEV technology such as aviation, locomotives, and marine applications. Biomethane currently displaces fossil fuels in transportation and will largely be needed for hard-to-decarbonize sectors but will likely continue to play a targeted role in some fleets while the transportation sector transitions to ZEVs".[59]

California's Integrated Energy Policy Report (IEPR) is the California Energy Commission's (CEC) leading document aimed at comprehensively addressing the state's evolving energy trends in the context of climate change and other environmental issues. CEC 2021 IEPR Volume III was entitled *Decarbonizing the State's Gas System*.[60] This document recognizes the role renewable gas can play in decarbonization of the gas system and encourages the use of renewable gases to achieve a variety of important environmental benefits. Notably, the report states that "there is increasing awareness that to fully decarbonize the gas system, there is a need for clean fuels or molecules in addition to clean electricity." The hydrogen section of the report also acknowledges that renewable organic waste feedstocks can be used to produce renewable hydrogen in a beneficial manner.

Columbia University

Columbia University's School of International and Public Affairs Center on Global Energy Policy conducted a study[61] focused on the use of the existing gas system in a carbon neutral world. Notably, the authors state that:

---

[57] Id., pg. 197

[58] Id., 192

[59] Id, 179

[60] California Energy Commission, *2021 Integrated Energy Policy Report, Volume III: Decarbonizing the State's Gas System*

https://efiling.energy.ca.gov/GetDocument.aspx?tn=242233

[61] Blanton et. Al, *Investing in the US Natural Gas Pipeline System to Support Net-Zero Targets* https://www.energypolicy.columbia.edu/research/report/investing-us-natural-gas-pipeline-system-support-net-zero-targets?utm_source=Center+on+Global+Energy+Policy+Mailing+List&utm_campaign=38d4ab05a7-

"[R]etrofitting and otherwise improving the existing pipeline system are not a choice between natural gas and electrification or between fossil fuels and zero-carbon fuels. Rather, these investments in existing infrastructure can support a pathway toward wider storage and delivery of cleaner and increasingly low-carbon gases while lowering the overall cost of the transition and ensuring reliability across the energy system. In the same way that the electric grid allows for increasingly low-carbon electrons to be transported, the natural gas grid should be viewed as a way to enable increasingly low-carbon molecules to be transported."

World Resources Institute

The role of RNG as a decarbonization strategy was also recently examined by the World Resources Institute, who published a paper illustrating how RNG fills an important niche as part of a broader low-carbon technology portfolio.[62] The authors state that:

"RNG has the potential to reduce methane emissions from organic wastes and provide fuel for applications that lack other low-carbon alternatives, such as heavy-duty freight or existing building and industrial heat sources."

"The report emphasizes the importance of considering RNG as a complementary fuel in applications where natural gas or other energy sources are currently used. In this way, RNG can be seen as a flexible, low-carbon fuel source that can potentially be deployed in a variety of applications, even as other vital strategies such as electrification are pursued in parallel."

Furthermore, WRI's analysis *How Methane Emissions Contribute to Climate Change* identifies "improving efficiency [in agricultural production practices, including manure management]", "separating organics and recycling", and "capturing landfill gas and reducing energy" as key methane abatement strategies. [63]

Modeling of Pathways to Carbon Neutrality

At this time, we believe New York to be the best example of a nearby state which is considering similar changes to its energy delivery system in the context of climate change. The analysis conducted for New York by the consulting firm Energy and Environmental Economics' (E3) in

EMAIL_CAMPAIGN_2019_09_24_06_19_COPY_01&utm_medium=email&utm_term=0_0773077aac-38d4ab05a7-102456873

[62] World Resources Institute, *Renewable Natural Gas as a Climate Strategy: Guidance for State Policymakers.*

https://www.wri.org/publication/renewable-natural-gas-guidance

[63] https://www.wri.org/insights/methane-gas-emissions-climate-change

June of 2020 identified switching to low-carbon fuels as one of the four pillars of decarbonization "critical to achieving carbon neutrality" in New York State, with scenarios including an 8-18% pipeline blend of RNG,[64] showing widespread RNG use across sectors. This is consistent with E3's high-electrification scenarios conducted in other jurisdictions, which show significant demand for gaseous fuels remaining in 2050.[65]

The New York City Mayor's Office of Sustainability, in collaboration with Con Edison and National Grid, published a study outlining three pathways by which New York City can achieve carbon neutrality by 2050.[66] All three pathways in the report—including the pathway with highest electrification—outlined the use of renewable gases as an essential part of this goal. Even in the case where it is possible to convert approximately 60% of New York City's building stock to all-electric applications by 2050, this study shows that RNG has a role to play. A key finding applicable to all scenarios was that, "in addition to providing a solution for buildings that do not electrify, a low carbon gas network improves overall system reliability by offering optionality and flexibility within the energy system."[67]

This key framing of the role of RNG in the above New York analyses is consistent with studies conducted for other jurisdictions—including California,[68] Minnesota,[69] Oregon and

[64] See slide 5 of E3's "New York State Decarbonization Pathways Analysis," presented to the Climate Action Council on June 24, 2020. https://climate.ny.gov/-/media/Project/Climate/Files/2020-06-24-NYS-Decarbonization-Pathways-CAC-Presentation.pdf

[65] For an example from other similar E3 work, see pg. 35 of the California Energy Commission report entitled *The Challenge of Retail Gas in California's Low Carbon Future,* which finds that natural gas in California's residential, commercial, and industrial sectors is still ~1,000 tBtu in 2050 in the high-building-electrification case: https://ww2.energy.ca.gov/2019publications/CEC-500-2019-055/CEC-500-2019-055-F.pdf

[66] New York City Mayor's Office of Sustainability, *Pathways to Carbon-Neutral NYC: Modernize, Reimagine, Reach.* https://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/Carbon-Neutral-NYC.pdf

[67] Id., xvii

[68] *Achieving Carbon Neutrality in California.* https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf

[69] Great Plains Institute & Center for Energy and Environment, *Decarbonizing Minnesota's Natural Gas End Uses.* https://e21initiative.org/wp-content/uploads/2021/07/Decarbonizing-NG-End-Uses-Stakeholder-Process-Summary.pdf

Washington,[70] Colorado,[71] and Maryland,[72] among others. Simply put, RNG is a necessary decarbonization strategy, even in high-electrification scenarios.

Building RNG Supply Quickly to Capture Methane from Organic Wastes is More Important in the Near-term than Debating the Sector that is the Long-Run Best Use

We believe the body of literature presented above shows that renewable gas has a clear role within any of Massachusetts' GHG reduction scenarios. However, the same literature also shows that there is diversity of opinion about the best targeted long-term uses of RNG. The RNG industry does not claim to be able to solve the daunting challenge of eliminating all organic waste methane emissions and decarbonizing the entire gas system alone, however, we believe that deciding on the best long-run end use is less important in the near term relative to ensuring that renewable gas represents a key component of Massachusetts' GHG strategy to reduce methane and begin to decarbonize gas supply.

As well stated by the World Resources Institute work referenced above:

> *"The viability of RNG as a decarbonization strategy will vary depending on regional context, and ultimately the role that it plays in decarbonization and how it complements other key strategies may shift over time. However, through careful consideration of the factors included in the preceding discussion, policymakers can explore and identify opportunities for targeted RNG production and use that can meaningfully contribute to GHG reduction goals. Overall, the flexibility of RNG, along with the methane emissions reductions associated with its production, mean that it can play a dynamic and complementary role in decarbonization in the long term."*[73]

Therefore, as summarized above in Figure 1, in the near-term Massachusetts should focus on new policy to deploy RNG quickly. Doing so does not preclude adjustments to its end use as the gas system transition takes place—an effort which will take significant time and require thoughtful infrastructure planning to determine the targeted long-run applications best served by clean gaseous fuels. Our industry remains open minded to those varying possibilities, and we

---

[70] *Pacific Northwest Pathways to 2050*. https://www.ethree.com/wp-content/uploads/2018/11/E3_Pacific_Northwest_Pathways_to_2050.pdf

[71] *Colorado GHG Reduction Roadmap Technical Appendix.* https://drive.google.com/file/d/1215j7zfCsgE50msF_ZJt6ZUj0iG7Th3V/view

[72] *Maryland Building Decarbonization Study.* https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/MWG_Buildings%20Ad%20Hoc%20Group/E3%20Maryland%20Building%20Decarbonization%20Study%20-%20Final%20Report.pdf

[73] World Resources Institute, *Renewable Natural Gas as a Climate Strategy: Guidance for State Policymakers. (*See page 37).

https://www.wri.org/publication/renewable-natural-gas-guidance

look forward to working with DPU and other stakeholders as the long-term vision for RNG use in Massachusetts evolves.

Renewable Gas and Clean Heat Standards

In designing its CHS, Massachusetts should look to other jurisdictions which have established similar thermal decarbonization programs. We believe that Tradeable Performance Standards (TPS) like a CHS have proven to be very effective tools in motivating RNG buildout specifically, and "fuel switching" through clean energy and infrastructure deployment more generally, toward decarbonizing the supply side of the transportation, gas, and electric sectors.

In general, a TPS sets a standard of technology performance but leaves technology choice to the program participants (e.g., clean technology companies and compliance entities). It increases the relative costs of technologies with undesirable GHG performance characteristics and lowers the costs of technologies with desirable GHG characteristics.

Jurisdictions focused on gas sector decarbonization have employed two primary types of policies aimed at incenting clean energy supply and infrastructure. Specific to gas supply only, a Renewable Gas Standard establishes targets for total renewable gas throughput, potentially including both RNG and renewable hydrogen, which increase over time.

Alternatively, a Clean Heat Standard can be used to incentivize clean heat resources more broadly, often including electrification and geothermal infrastructure alongside renewable gases. We believe that employing a CHS will be crucial to meeting both near- and long-term decarbonization goals in Massachusetts.

As part of California's gas sector decarbonization strategy, the California Public Utilities Commission (CPUC) voted unanimously to adopt a RGS in early 2022. Establishing a 12.2% procurement mandate for utilities' core gas customers by 2030, with a smaller mid-term target in 2025, this program is also viewed by the state as an important component of their methane reduction and landfill diversion strategies, with the near-term RNG requirement being largely based on potential from organic waste diversion projects.[74]

In addition to reducing methane emissions and replacing fossil-derived natural gas, the program is designed to facilitate the broader environmental benefits of RNG development. This is accomplished by prioritizing facilities which include carbon sequestration to further reduce emissions and achieve carbon negativity; prioritizing facilities which use their waste byproduct to create soil amendments such as a compost and biochar; requiring the buildout of pilot facilities which use wood waste feedstocks in gasification applications to reduce forest fire risk; and prioritizing facilities which use zero or near-zero emission trucks. These provisions

[74] https://www.cpuc.ca.gov/news-and-updates/all-news/cpuc-sets-biomethane-targets-for-utilities

exemplify the potential of RNG to contribute to broader environmental goals, including strengthening and circularizing the state's bioeconomy.

In May of 2022, the Minnesota Public Utilities Commission (MPUC) voted unanimously to adopt a carbon intensity (CI) and cost-benefit analysis (CBA) framework pursuant to the *Natural Gas Innovation Act*—a first-of-its-kind Clean Heat Standard in North America.[75] This program allows the state's gas utilities to propose investments in a variety of clean energy resources and infrastructure, including RNG, renewable hydrogen, electrification, geothermal, and energy efficiency, among others. Each resource mix must be compared based on cost-effectiveness, which includes lifecycle CI scoring for RNG and renewable hydrogen. Clean Heat policies such as this are significant because of their ability to incent the full spectrum of resources that are shown to be necessary for gas sector decarbonization. Jurisdictions which have adopted either a RGS or CHS include British Columbia,[76] California, Colorado,[77] Minnesota, New Hampshire,[78] Oregon,[79] and Quebec.[80]

Some stakeholders rightfully acknowledge that the transition away from fossil natural gas—particularly given the potential for electrification of many residential and commercial customers who underly current business models for gas distribution utilities—needs to be conducted deliberately and carefully to avoid an unbalanced system for remaining gas customers. Furthermore, planning for gas sector decarbonization must take into account the time required for fuel-switching, where feasible, as well as the continued need for gaseous fuels in certain applications. It is likely that this transition will require changes in rate design for gas utilities, which deserves deliberate consideration under the CHS development process, and under complimentary proceedings at the Department of Public Utilities and otherwise.

Allowing gas utilities to invest broadly in renewable thermal infrastructure such as renewable gas supply (with a goal of ultimately achieving 100% of supply from renewable sources), dedicated hydrogen infrastructure, geothermal energy, and electrification could provide a pathway for the development and maintenance of the spectrum of sustainable energy infrastructure required to serve all of Massachusetts' thermal needs in the future.

---

75 https://www.revisor.mn.gov/bills/text.php?number=SF0421&session=ls92&version=latest&session_number=0&session_year=2021

76 https://news.gov.bc.ca/releases/2021EMLI0046-001286

77 https://leg.colorado.gov/sites/default/files/2021a_264_signed.pdf

78 https://legiscan.com/NH/text/SB424/id/2528713#:~:text=New%20Hampshire%20Senate%20Bill%20424&text=Bill%20Title%3A%20Relative%20to%20renewable%20energy%20and%20natural%20gas.&text=AN%20ACT%20relative%20to%20renewable%20energy%20and%20natural%20gas.&text=This%20bill%20authorizes%20the%20recovery,of%20the%20public%20utilities%20commission.

79 https://olis.oregonlegislature.gov/liz/2019R1/Measures/Overview/SB98

80 https://www.legisquebec.gouv.qc.ca/en/pdf/cr/R-6.01,%20R.%204.3.pdf

GHG Accounting Methodologies for Bioenergy

Point Source Accounting vs. Lifecycle Accounting

There are two distinct GHG emission accounting approaches commonly used in regulatory programs for bioenergy today: the "point-source biogenic CO_2 emissions are carbon neutral" approach and the "lifecycle" approach. Programs built on lifecycle analysis are more likely to produce better incentives for biofuels and bioenergy.

When using a point-source approach, GHG emissions from bioenergy are assessed only at the point of use—such as in a home, business, vehicle, power plant, or industrial facility. When determining these point-source GHG emissions, the biogenic carbon dioxide produced from the combustion of a biomass-derived input is often assumed to be counteracted by the carbon dioxide that was recently removed from the atmosphere when the biogenic material was grown, and thus netted out of any final compliance obligation.[81] The use of such a point-source framework is appropriate if it is expected that the upstream emissions (e.g., pipeline leakage) and upstream GHG sinks and avoided emissions (e.g., methane emissions from organic waste) will be accounted for by other jurisdictions under analogous programs.

A lifecycle approach[82] (LCA) accounts for GHG emissions generated from a fuel's production through its end-use—the full life of the fuel.[83] The lifecycle approach for GHG emission accounting for biofuels can also be referred to as a "well-to-wheels" or "full fuel cycle" approach. This approach accounts for all of the GHG emissions produced or avoided from the production, collection and processing, transmission and delivery, and ultimate use of a fuel (including upstream sinks and final point-source emissions).

When determining the lifecycle GHG emissions factor or carbon intensity, the GHG emissions are summed across each stage, and the end user of the fuel is responsible for all emissions. A full lifecycle approach is appropriate if other jurisdictions do not have programs to account for these upstream sources and sinks, or simply if the jurisdiction's goal is to create the proper incentives to reduce global emissions across an entity's entire biofuel or bioenergy supply chain.

Fundamentally, it is appropriate to track biogenic carbon dioxide emissions from use of biomass and biofuels as a line item in any point source emission accounting, and to appropriately "net

[81] For example, the Regional Greenhouse Gas Initiative uses this approach.

[82] Lifecycle analysis is well established as the leading way to holistically compare greenhouse gas abatement options. It is frequently used for bioenergy (inclusive of biofuels), but also has a role in comparing many other types of GHG abatement. The term "life cycle" appears 143 times in the IPCC's *Climate Change 2022, Working Group III contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_FinalDraft_Chapter10.pdf

[83] https://www.epa.gov/renewable-fuel-standard-program/lifecycle-analysis-greenhouse-gas-emissions-under-renewable-fuel

out" CO_2 biogenic emissions or sinks as a step in any accounting of such fuels. Conversely, it is not appropriate to treat biogenic CO_2 from the use of biomass and biofuels as identical to CO_2 from fossil fuels (thus ignoring the upstream sink as the biogenic material is grown).

With this in mind, analyses of RNG, hydrogen, and other energy resources under consideration by the Commonwealth should rely on proven LCA tools, such as the Greenhouse gases, Regulated Emissions, and Energy use in Technologies Model (GREET) from Argonne National Labs, that are supported by more than 25 years[84] of research and peer review.[85]

Renewable Gas Creates Green Jobs and Provides a "Just Transition" for the Gas Sector Workforce

Ensuring a just transition away from traditional energy sources and industries should be an important consideration for Massachusetts and has been identified as a key concern for workers and community voices in past proceedings. Indeed, it is likely that many of the technologies considered by the Commonwealth will lead to the eventual obsolescence of some existing oil and gas *extraction* infrastructure as fossil fuel use declines. However, stakeholders must consider how certain necessary components of the state's GHG reduction strategy, such as renewable gas and liquid biofuels, will support the long-term use of a subset of the existing *distribution* infrastructure and associated jobs in a beneficial manner, in addition to the important opportunity to promote high-quality manufacturing jobs in Massachusetts from emerging technologies.

The process of decarbonizing all sectors which currently utilize fossil natural gas will involve increasing renewable gas supply while systematically pruning portions of the gas system subject to electrification. From an employment standpoint, the utility gas industry currently provides well-paying union jobs for skilled workers across Massachusetts. Therefore, it is important to consider apprenticeship opportunities and high-road pathways to green jobs provided by renewable gases, which in turn will advance the state's goals of broadening access to middle-class jobs while resolutely addressing the climate crisis.

While gas industry jobs have historically fallen under the fossil fuel industry umbrella, those which are retained will become green jobs as the pipeline system transitions to a clean fuel system and RNG methane capture projects begin to employ this skilled labor. With this in mind, Massachusetts should study which portions of the pipeline are expected to be needed for renewable gas delivery over different timeframes, and should map employment expectations and gaps accordingly.

RNG Coalition best understands the employment benefits at the RNG facilities themselves. For example, Massachusetts should move forward with organic waste recycling mandates, which

[84] https://www.epa.gov/system/files/documents/2022-03/biofuel-ghg-model-workshop-biofuel-lifecycle-analysis-greet-model-2022-03-01.pdf
[85] https://greet.es.anl.gov/

would necessitate new facilities to process the additional quantities of organic waste, stimulating employment in the sustainable waste management and industrial building construction industries, among others. For comparison, California is projected to create 11,700 permanent jobs based at more than 80 new or expanded compost or anaerobic digestion facilities based on CalRecycle's organic waste recycling goals.[86]

The RNG industry currently has more RNG plants under construction or substantial development than in existence. Therefore, RNG contribution to jobs and the economy will inevitably increase. This represents an important opportunity for employment in Massachusetts given that RNG jobs are high paying, the vast majority of which fall well above the national average personal income. In 2021, the RNG industry contributed 22,600 Jobs and $2.6B in GDP to the U.S. economy, and could contribute 200,000 jobs by 2030 if the U.S. is on track to achieve carbon neutrality by 2050. Every $1 million spent on RNG production in 2021 created approximately 12 jobs.[87]

Conclusion

Based on extensive research, modeling, and experience from existing policies aimed at achieving carbon neutrality, RNG has demonstrated it can play a key role in reaching deep decarbonization goals in Massachusetts and globally.

To achieve methane reductions, RNG should be generally incentivized for use in any application to displace fossil fuels in the near-term, including those which may ultimately be electrified. There remains such a large demand for conventional fuels, and the RNG industry is still so nascent, that there is no need to determine the ultimate end use of the sustainable RNG resources immediately. In the long-term, renewable gases should be targeted toward applications that are not suitable for electrification. With this framework in mind, we urge DEP to work with stakeholders in developing a strategy which sends a clear signal about Massachusetts' vision for the use of renewable gases, including under the CHS.

Our industry stands ready to deploy renewable gas technologies which will reduce methane emissions, displace fossil fuel supply, improve organic waste management, produce useful soil amendments, and ultimately sequester carbon in Massachusetts. We commend Massachusetts' agencies and all stakeholders for your significant work toward the Commonwealth's GHG reduction goals and look forward to continued collaboration in developing a CHS.

[86] https://www.nrdc.org/sites/default/files/green-jobs-ca-recycling-report.pdf

[87] https://static1.squarespace.com/static/53a09c47e4b050b5ad5bf4f5/t/61ba25c889b4fb7566404e6c/1639589328432/RNG+Jobs+Study.pdf

SCOTTWILLIAMS
Incorporated

April 28, 2023

Mass DEP

Re: Clean Heat Standard Stakeholder Process

To whom it may concern:

My name is Ken Williams. I am the President of Scott-Williams, Inc. I am the third generation of my family to run a heating oil and HVAC company, located in Quincy, MA. My company services nearly 3000 customers in the area south of Boston and has been in business since 1938. We have been delivering low sulfur Bio-Fuel for more than 4 years and we also install heat pumps in the appropriate application.

I'll start my remarks with a link to an article in the Boston Globe today. https://www.boston.com/real-estate/home-improvement/2023/04/19/state-senator-calls-heat-pump-installation-not-a-great-move-for-him/ In the article Sen. William Brownsberger reported "mixed results" with his newly installed heat pump and urged people to "go slow" in their adoption. A Democratic Senator in Massachusetts making that statement in reality screams "stay away-not ready for prime time!" As an installer of heat pumps I can attest to that fact. They are expensive to install, comparitively inefficient, expensive to operate given that electricity in this state is among the most expensive in the nation, and they are utterly impossible to repair. In cold weather, they fail to adequately heat homes, need to have snow cleared off them, and simply are not comparable to conventional heating systems at this time. The Senator's comments are telling. It's clear he regrets the installation of the equipment both financially and in regard to their impact on GHG emissions. Wait until he needs a winter repair...

On a personal business level, just an hour ago we surveyed a heating job in Randolph, MA. The home currently operates on an air to air heat pump. The owner's electric bill last month was $1900! This was in March, in a decidedly warm winter. This is a modest raised ranch, which would probably use 500-600 gallons of fuel a year. That cost at current rates would be under $2000.00 for the entire year. She's asking us to convert her home to an oil fired furnace. Her payback, given her experience, would be less than two years. As such, do you really think that anyone with a shred of intelligence is going to embrace heat pumps?

As noted, my company has delivered low sulfur bio fuel at a 20% mix (B20) for several years now. What that means is that we have had an immediate impact on GHG emissions for every one of our customers. No one had a dime of extra heating expense, did not have to add expensive, problematic equipment, and had the security of a 24 hour local repair network. While decision makers at the DEP have dithered over policy my trade has done something about the climate issue. The industry has a clear path to 50% reduction of GHG by 2030 and zero carbon by 2050, all with the same parameters – no new equipment cost, no extra

92 Copeland Street ▪ Post Office Box 542 ▪ Quincy, MA 02269 ▪ Phone: 617-773-2870 ▪ Fax: 617-847-1649

operating cost, and the security of a service network. Cutting our industry out of the solution and blindly relying on the adoption of heat pumps is a recipe for failure. Arresting climate change is an "all-in" process, not a one size fits all.

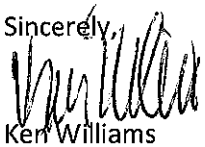
In regard to Biofuel, it frustrates me to know that MA only will consider recycled cooking oil as biofuel, while other states, including CA and OR allow soy-based fuel as solutions to GHG emissions. The same can be said for the EPA. Why is MA not considering soy based biofuels when they are a proven solution?

In regard to electrification, I have two letters on my desk, one from Groton Electric and the other from the CEO of Eversource. Both said the same thing going into this winter: If it gets cold prepare for rolling blackouts. A warm winter dodged that bullet, but what about next year? How can the DEP advocate moving the heating load now covered by delivered heating fuels to electricity, when we can barely meet current demand? Additionally, since more than 60% of our electricity is generated by fossil fuels (natural gas) how can you say you are reducing emissions by converting to heat pumps? While renewable sources may come on line the additional load would ensure these natural gas plants continue to run for decades. In case you forgot, due to leaking methane, natural gas is highly impactful to climate change. Yet, in terms of carbon scoring the DEP is apparently leaving electric generation out of the mix? How does that even happen? It's clear that this effort has more to do with eliminating the delivered fuels trade than it does in lowering GHG emissions.

To sum up, it is clear to me that the efforts to "electrify everything" in the Commonwealth are doomed to failure on all fronts. No matter what the incentive, heat pumps will not be willingly adopted by homewners who are stretched thin already. Those that do make the move are in for uncertainty and higher costs to heat their homes. In the meantime, trying to push the delivered fuels trade out of business, the sole entity that is making progress on lowering GHG emissions is completely counterproductive. It is unfortunate that an unelected, non-representitive agency that is completely disconnected from the financial and operational realities of domestic space heating are making these decisions. In fact, it's more than unfortunate, it's delusional.

Finally, the 5 day period to make comments on this issue is almost comical. As Senator Brownsberg said "go slow" should be the operational word of the day. Instead, this process clearly indicates the DEP intends to move forward on this no matter what comments are made. Such is the sad state of affairs when regulation replaces legislation.

Sincerely,



Ken Williams
Scott-Williams, Inc.
Quincy, MA 02169

The Commonwealth of Massachusetts
MASSACHUSETTS SENATE
OFFICE OF THE MAJORITY LEADER

SENATOR CYNTHIA STONE CREEM
MAJORITY LEADER
First Middlesex and Norfolk District

STATE HOUSE, ROOM 312A
BOSTON, MA 02133-1053
TEL. (617) 722-1639
FAX (617) 722-1266
CYNTHIA.CREEM@MASENATE.GOV

May 1, 2023

Commissioner Bonnie Heiple
Massachusetts Department of Environmental Protection
100 Cambridge Street, Suite 900
Boston, MA 02114

Dear Commissioner Heiple,

I am deeply appreciative of your work to develop a Clean Heat Standard ("Standard") for Massachusetts, an idea which has the potential to meaningfully accelerate our transition to clean forms of heating. Thank you for allowing me and other stakeholders the opportunity to share our thoughts on how the Standard should be designed and implemented. I would like to offer the following comments:

1. **The Standard should not incentivize the blending of hydrogen into the gas distribution system.**

If the Standard includes hydrogen, it should only include so-called green hydrogen, which is made from renewable electricity. Moreover, it should not incentivize the blending of hydrogen of any kind into the gas distribution system. Green hydrogen has appropriate uses that the Standard could incentivize, including in industrial processes where electrification is not feasible, but it does not belong in the pipes that serve our homes and commercial businesses. That is true for several reasons. One, the renewable energy necessary to produce large amounts of green hydrogen would be better used to decarbonize our electric grid. Two, hydrogen can only be blended into the gas system at a level of around 20 percent, and even that would require expensive upgrades to the distribution system. The emissions reductions from such blending would be too limited to justify the costs. Three, hydrogen is explosive and corrosive, so introducing it into the gas distribution system would pose safety concerns. Four, hydrogen has indirect warming effects, so hydrogen leaks from pipelines would exacerbate climate change.

2. **The Standard should not incentivize the blending of biomethane into the gas distribution system.**

The Standard should not incentivize blending biomethane into the gas distribution system. Biomethane, sometimes referred to as renewable natural gas, may have a limited role to play in our transition to clean heating, but we do not have sufficient feedstocks for it to become a major alternative for natural gas. Nor is biomethane an ideal climate solution, given that it can still leak from pipelines and contribute to warming. As with green hydrogen, biomethane is best used in areas where electrification is not feasible. If the Standard does include biomethane, it should only reward uses on the sites where it is produced or uses related to decarbonizing hard-to-abate sectors of the economy.

3. **The Standard should exclude hybrid conversions to clean heating.**

Some building owners choose to install an air-source heat pump while also maintaining a fossil fuel-powered source of thermal energy. This sort of hybrid conversion raises several concerns. One, it is more difficult to ascertain the climate value of a hybrid conversion because building owners could continue to rely exclusively on their fossil fuel-powered heating source. Two, if hybrid conversions are common, we may find ourselves in a situation where we are paying for both a heat pump-based thermal energy system and a gas system that is in limited use. The costs of maintaining both systems simultaneously would be enormous. Part of the value of transitioning to heat pumps is that it will enable us to strategically decommission portions of the gas system and reduce the costs of maintaining that system. Widespread hybrid conversions would frustrate our ability to achieve that goal.

4. **The Standard should incentivize geographically targeted conversions to clean heating.**

The Standard should reward investments in zonal electrification projects by allowing such projects to generate additional clean heat credits. Converting an entire street, neighborhood, office park, or campus to networked geothermal or air-source pumps is preferable to a piecemeal, geographically random transition to clean heating, because it enables us to avoid continued investment in the local gas network. A geographically targeted transition is thus essential to our ability to strategically decommission the gas system and prevent costs from spiraling out of control for gas customers who are late to the transition. Zonal conversions are also more cost-effective for electricity ratepayers, because they can be targeted to areas where there is excess local electric capacity.

5. **The Standard should reward efforts to bring clean heating to low-income communities.**

If it is not done carefully, the transition to clean heating could leave low-income communities behind and raise energy costs for those who can least afford it. I appreciate the emphasis that your discussion document places on equity, and I urge you to implement some mechanism, such as a carveout, that would encourage or require investments in low-income communities. I also urge you to consult with low-income communities as the Standard is developed, and to make equity a key consideration in every element of the program's design.

Thank you again for providing this opportunity to provide feedback and for your consideration of my comments. Please do not hesitate to reach out my office with any questions.

Sincerely,

Cynthia Stone Creem
State Senator
Norfolk and Middlesex District

Lamb, Emily (DEP)

From: Mark Sobon <mark.sobon@yahoo.com>
Sent: Monday, May 1, 2023 12:01 PM
To: Strategies, Climate (DEP)
Subject: No future for heating oil companies

To whom it may concern,
I was just notified of this bill on Friday. Nothing in this is a help to our industry but rather a detrament. The fact that they want 3% heat pump installation on an annual basis will drive us out of this industry, I have never heard of anything more ridiculous!!!!!!!!
We also use 20% biofuel, what will the new reg affect with this????

Massachusetts Department of Environmental Protection
100 Cambridge Street
Suite 900
Boston, MA 02114

RE: Clean Heat Standard Stakeholder Commentary

To Whom It May Concern,

Today I write to you as a stakeholder regarding the proposed Massachusetts Clean Heat Standard. I am the Vice President of Fuel Operations at Tasse Fuel Corporation headquartered in Southbridge, Massachusetts with a second location, Crowley Fuel, located in North Brookfield, Massachusetts. Together, we serve over 20 communities and 3,300 customers. We have been in business for a combined 180 years.

My company sells deliverable fuels (heating oil, propane, biofuel, kerosene) and provides HVAC and home comfort service to many Massachusetts communities that would be affected by the proposed MA Clean Heat Standard. I write this letter today with grave concerns about the implementation of the MA Clean Heat Standard ("CHS"), not only for my business and its employees but for all Massachusetts residents and consumers of delivered fuels in the state as well.

The poorly written CHS rule-making calls into question the seriousness and professionalism of its architects and their grasp of basic Massachusetts Consumer Protection and Business law. It raises serious questions about their motivations regarding the lack of due diligence to assess the economic and operating impacts of the CHS on MA small businesses and MA consumers this standard will surely affect. Some concerns:

- The omission of renewable fuels in the form of renewable propane, renewable diesel, and renewable heating oil and gasoline tells us that there has been no consideration of their contribution to achieving climate goals. The fact that renewable fuels go wholly un-addressed in this rulemaking is a serious omission and tells us that the rulemaking process is deeply flawed to begin with. If the goal of this clean heat standard is truly to reduce climate impact, all alternative renewable fuels must be considered under the CHS as literature has proven these fuels will be less carbon-intensive and are an IMMEDIATE reduction in CO2 and atmospheric carbon ***and ARE ALREADY*** being delivered within the state by the businesses that the CHS is attempting to regulate.
- Another un-addressed solution to reduce the climate impact of hydrocarbon fuels in the state immediately is expanding the Massachusetts Alternative Portfolio Standard to include all bio- related feedstocks. Currently, it is relegated to cooking fats only and acts as a bottleneck on an easily achievable carbon reducing strategy. We would like to see the expansion of the APS to include those feedstock types that the USDA ***ALREADY*** creates approved RINS for. All renewable forms of energy must be included or addressed in the rulemaking, yet NONE of this was considered in the CHS.
- This rule making creates its own Massachusetts model for calculating and scoring carbon intensity and does not use the industry and globally accepted GREET method for calculating carbon intensity. Why is it that we are creating our own (potentially flawed) carbon calculator specific to MA? The proposed carbon calculation contribution is not an industry standard nor close to any previously modeled calculation in current literature.

- Electric generation using hydrocarbon fuels by utilities is not scored in the CHS and seems to be exempt from this rulemaking. It seems curious that such a large atmospheric carbon contributor is wholly left out from the CHS rulemaking. Why is electricity generation from fossil fuels exempt from this rulemaking if the goal is to reduce emissions and be compliant with our climate goals for the state? Why should an out of state utility delivering electricity to Massachusetts residents be considered any different than a small Massachusetts energy dealer delivering fuel to the same homes?
- There are many issues yet brought up, but unresolved, in the proposal for out-of-state fuel dealers and companies that may be headquartered outside of the state of Massachusetts but deliver fuels to Massachusetts residences. Conversely, businesses within Massachusetts that deliver outside of the state are a separate un-addressed issue as well. These issues are partially addressed but wholly inadequate as written to seriously think about implementing at this time.
- The Clean Heat Standard proposed carbon reduction calculations penalize dealers in arrears for what has already happened in the previous years' business operations. It has the effect of limiting (read: punishing) organic growth of these family businesses within the state.
- The self-reporting regulations are burdensome to small businesses. Many fuel dealers are smaller family businesses without the resources or capacity to comply with increased administration and regulatory issues.
- The proposal is written without a real method for oversight and regulation and without penalty for non-compliance. There are zero provisions for state enforcement or regulation, or compliance contained in the standard as written.
- To require retail heating oil and propane dealers to convert 3% of their customer base annually to electric heat pumps is an anti-competitive practice and possibly in violation of a number of constitutionally protected rights of business to operate within the state.
- To require forced conversion from one fuel source to another or rules that favor one heating system over another infringes upon Massachusetts' Consumer Protection Act and rights.
- In addition to completely ignoring many consumer protection laws, we believe many of the measures as written in the CHS oversteps MA DEP's legal operating purview and therefore would expect the state to be on the receiving end of a number of lawsuits for the CHS as written.

Simply put, the Massachusetts Clean Heat Standard has many obvious flaws, is not well-researched and lacks the basic understanding of business and consumer protection laws in the state of Massachusetts. The CHS regulations, as written, place undue economic and regulatory burden on Massachusetts residents, consumers and small businesses within the state. Its contribution to achieving the climate goals of the state is extremely unclear and unquantified. Its lack of a study on the potential economic impact on Massachusetts consumers and small businesses should make it a clear non-starter. **I strongly urge you to not enact the MA CHS rules until a comprehensive study with adequate public input looking at economic, energy security, and fairness across ALL hydrocarbon users is completed.**

I remain optimistic that with enough consideration, due diligence, and planning that a MA Clean Heat Standard that makes sense for all and contributes to achieving the MA climate goals can be implemented in the future.

Sincerely,

Ryan Roy
Vice President Fuel Operations
Tasse Fuel / Crowley Fuel
37 Hook Street
Southbridge, MA 01550
508-765-0841

May 1, 2023

By email to Bonnie.Heiple@mass.gov

Bonnie Heiple, Commissioner
Department of Environmental Protection
100 Cambridge St Suite 900
Boston, MA 02114

Re: Draft Clean Heat Standards Regulations

Dear Commissioner Heiple,

On behalf of the thousands of workers across Massachusetts employed by National Grid USA and represented by the United Steelworkers Union, Locals 12003 and 12012, and the Utility Workers of Union of America, Local 369, respectively, we, the undersigned, congratulate you for your appointment and thank you for taking on your incredibly important role at this crucial moment in time. By good fortune, we have a tremendous state with strong, progressive values and formidable leaders who put people first. By necessity, we must fight this fight against climate change together. Thus, we also thank you for the opportunity to provide comments regarding the development of draft Clean Heat Standard regulations.

We would first like to acknowledge the comments provided by National Grid and express our appreciation for the thoughtfulness of those comments and the company's visions for the future of clean energy delivery in Massachusetts. We write today to briefly underscore our support for certain key aspects of the draft Clean Heat Standards Regulations highlighted by National Grid.

Above all, we recognize that all options must be on the table as we work towards achieving net-zero emissions. There is no switch that can be flipped to eradicate the use of and need for fossil fuel in our region overnight. For that reason, we strongly support the notion that Clean Heat Standards be *technology neutral* --- with compliance determined on the basis of actual greenhouse gas emissions reductions from qualified technologies --- as we undertake this massive and complex transition to net-zero emissions.

In that same vein, we also strongly agree that eligible technologies to support deep decarbonization in the building sector should include, but not be limited to, air source heat pumps, district geothermal heating loops, hybrid systems, carbon capture technology and other renewable thermal solutions, and alternative low-carbon fuels including renewable natural gas (RNG) and green hydrogen.

As energy workers, among other things, we have considerable insights into the existing infrastructure currently utilized for supplying gas to customers and are uniquely positioned to play a vital role in repurposing that infrastructure to deliver clean alternative fuels such as RNG and hydrogen. And we appreciate National Grid's recognition of that fact, as well as its understanding of the challenges and uncertainty faced by its workforce, our members, and their loved ones, now and in the years to come.

In the meantime, we are looking forward to bringing all we can to the table as we work together with the Department and the Healey-Driscoll administration towards meaningful emissions reductions across Massachusetts. We thank you for undertaking this critical work while ensuring justice and equity for the most vulnerable in our communities, including the dedicated workers we collectively represent. It is no small task, but we will be there with you for the long haul.

We look forward to providing further comments when the official draft regulations are issued.

In Solidarity,

Daniel O'Connell
Local 12003, United Steelworkers Union

John Buonopane
Local 12012, United Steelworkers Union

Daniel Leary
Local 369, Utility Workers Union

May 1, 2023

BY ELECTRONIC SUBMISSION

Massachusetts Department of Environmental Protection
1 Winter Street
Boston, MA 02108

RE: Clean Heat Standard Program Design

Vicinity Energy Inc. (Vicinity) is pleased to provide comments to the Massachusetts Department of Environmental Protection (MassDEP) to inform the development of a proposed Clean Heat Standard (CHS). We applaud Commissioner Bonnie Heiple and MassDEP staff for their continued commitment to achieve an economy-wide reduction of greenhouse gas emissions in Massachusetts of at least 85% below the 1990 level, one of the most ambitious emission reduction plans in the United States.

Vicinity operates a vast district energy network that supplies thermal energy to over two hundred and thirty buildings and more than 70 million square feet of space in Boston and Cambridge. This thermal energy heats buildings, heats and chills water supply, cools spaces during summer months by way of steam-driven air conditioning and enables advanced production technologies that rely on processes such as sterilization and humidification. Vicinity serves many of the most critical customers in Boston and Cambridge, including all the major downtown hospitals. Ongoing reliability of supply to these customers is of the utmost importance as we transition to a decarbonized future.

Currently, Vicinity operates a combined heat and power (CHP) unit in Cambridge (Kendall Station), which generates electricity delivered to the grid as well as cogenerated thermal energy. Producing thermal energy from a central plant eliminates the need for installation and management of less efficient on-site boilers (thereby increasing emissions), increases the reliability of energy supply and eliminates the dangers of on-site fuel combustion.

In October of 2020, Vicinity released our own 2050 Net Zero Carbon Roadmap and, with this plan in place, we know we can make unique and vital contributions to the Commonwealth's greenhouse gas emissions reductions goal**.** As part of Vicinity's 2050 Net Zero Carbon Roadmap, we have already taken drastic steps toward the decarbonization of our operations and a migration away from carbon emitting fuels. These efforts will have a dramatic impact on the carbon footprint of the 70 million square feet of space we serve today as well as the future buildings we connect to our system.

The backbone of Vicinity's decarbonization plan is to electrify its operations by generating steam using electric boilers and heat pumps and procuring renewable electricity from the grid as our primary fuel source. (eSteam™: https://www.vicinityenergy.us/products-services/esteam). The electrification of individual buildings in Boston and Cambridge will be an incredibly challenging and expensive task in the time frame required. By connecting to the district energy system, building owners will have the ability to successfully meet state and local regulations and have access to 100% renewable, carbon-free thermal

energy. **This plan will enable us to eliminate 400,000 tons or more of carbon annually by 2035, which will greatly impact the reduction of emissions in the Commonwealth.** (See Appendix A)

As noted in the recently released Clean Energy and Climate Plan for 2025 and 2030 (CECP 2030), emissions from the operation of Massachusetts buildings were equal to approximately 30% of the Commonwealth's total greenhouse gas emissions in 2020. This is a direct result of the building sector's heavy reliance on on-site combustion of fossil fuels for space and water heating. Across much of the Commonwealth, building efficiencies and the electrification of heating can be relied on to decrease emissions.

However, in urban areas, dense construction and the long lives of commercial buildings will make it nearly impossible to electrify without significant retrofit costs and grid congestion. In these areas, production of thermal energy with progressively lower carbon content at a central plant and supplying it to end use customers through an extensive district energy distribution network will remain the most efficient and cost-effective way to condition these buildings without compromising reliability. Vicinity encourages MassDEP to include district energy distribution (i.e. steam, hot water, chilled water, etc.) in its proposed regulations as a valuable tool to be relied on by the Commonwealth to achieve its 2050 net zero statewide greenhouse gas emissions goal.

To further aid the Commonwealth in achieving its greenhouse gas emissions reductions goals, Vicinity recommends including the following policy portfolio considerations:

- The Alternative Portfolio Standard (APS) currently lists the criteria for large, water-source heat pumps to qualify for the program and the means to generate APS credits. This is stipulated within 225 CMR 16. The Massachusetts Department of Energy Resources (DOER) Guideline (*Metering and Calculating the Useful Thermal Output of Eligible Renewable Thermal Generation Units*), which is referenced within the same regulation, stipulates criteria that effectively eliminates the largest and most efficient industrial heat pump complexes from consideration. The DOER's guidelines provide specific temperature requirements that are not applicable to high temperature industrial heat pumps and only apply to those appropriate for residential and small commercial settings. In addition, the DOER guidelines introduce efficiency criteria that effectively eliminate any industrial heat pump complex seeking to generate at temperatures well above normal spacing heat or domestic hot water use. This not only introduces confusion, but also partially excludes Vicinity's aggressive, efficient, and exciting heat pump complex from the program. We do not believe these guidelines are in the best interest of Massachusetts's decarbonization efforts and recommend MassDEP support the following changes to DOER guidelines:
    1. The DOER Guideline should be revised to use temperature criteria that is reflective of a high temperature heat pump;
    2. The DOER Guideline should use a coefficient of performance (COP) that reflects the type of COP that is achievable when doing high temperature discharges and high temperature lifts; and
    3. The DOER Guideline should recognize waste heat (suitable for industrial heat pumps) as a qualifying heat source.

- As an alternative to, or in conjunction with heat pumps, building owners should evaluate connecting to the district energy system where available, leveraging thermal energy delivered in the form of steam, hot water, or chilled water. Thermal energy heats and cools buildings by

transferring energy from the district energy network to/from the buildings heating and air conditioning systems. It also enables advanced production technologies for clinical and life sciences manufacturing and research that rely on processes such as sterilization and humidification. For many buildings, connecting to the system will be more efficient, more reliable due to system redundancies, and cost effective depending upon the building, location, and existing infrastructure. During cold periods when commercial heat pumps require auxiliary heating to meet building requirements, district heating could provide the needed "lift" to meet critical high temperature processes that cannot be served by commercial heat pumps alone.

- In densely developed urban areas, where building-by-building electrification may prove to be difficult and expensive, customers who are currently receiving steam through the district energy system should be encouraged to continue doing so. Customers in low-income and environmental justice communities who are unable to electrify their heating uses should be incentivized to obtain their thermal energy needs by connecting to a district energy system that can leverage low carbon and renewable energy sources whenever feasible.

- Vicinity's procurement strategy for renewable electricity to generate eSteam™ is intentionally flexible. As we discuss options to serve our customers with renewable thermal energy (eSteam™), we are proposing a few different renewable alternatives, including Power Purchase Agreements – Physical, Power Purchase Agreements – Financial, and Renewable Energy Certificates ("RECs"). Our intention is to design our renewable energy purchasing to be compliant with state and local regulations. We strongly recommend the Commonwealth recognize a multitude of carbon neutral electrical sources and a diversity of decarbonized certification to allow time for large scale renewables to come online. These sources should include:
    1. Renewable/decarbonized certificates for electrical supplies outside of the New England ISO grid; and
    2. Carbon neutral electricity generated sources and associated certificates of generation within and outside the New England Grid.

- Incentivize the use of energy sourced from alternative fuels by facility owners. Energy sourced through electrification, renewable natural gas, other biogenic fuels, hydrogen blends, etc. can be used to achieve carbon emission reductions with minimal infrastructure changes to facilities currently using pipeline gas.

- As accurately noted in the CECP 2030, "additional clean energy resources are likely to be needed to ensure there are sufficient balancing resources available when intermittent renewable energy is not available". Vicinity recommends updating the Clean Peak Energy Portfolio Standard to include thermal energy storage systems as a qualified energy storage system and updating the clean peak resource definition to include the dispatch of thermal energy to an interconnected thermal energy distribution network. Similar to electric energy storage systems, thermal energy storage systems will allow Vicinity to procure the greenest, most affordable electricity when it is available (typically overnight, offshore wind), generate heat, and store it in the thermal battery until district heating demand is high (early morning as buildings heat up for the workday). Because there is a several-hour disconnect between our morning peak steam generation and peak renewable generation, our future plans to further decarbonize our district energy system will include the installation of up to 1,000 MWh of thermal storage. Using molten rock

technology, thermal storage will allow us to mitigate the cost and carbon content of electrified steam by procuring renewable energy during the overnight hours when demand is low and storing it in the thermal battery until district heating demand is high, typically the early morning hours as buildings heat up for the workday. As a result, Vicinity will dramatically lower the average cost of renewable thermal energy for our customers.

Finally, the Massachusetts Commission and Task Force on Clean Heat has been tasked with addressing statutory, regulatory, and financing mechanisms needed to develop reliable and affordable clean heat solutions in the Commonwealth's buildings by 2023. While the role of the Commission and Task Force, in consultation with MassDEP, is to design and recommend long-term emission caps on heating fuels, it will be imperative for this Commission to also identify sustainable and cost-efficient ways to replace natural gas and oil with clean alternatives to heat buildings adequately and reliably across the Commonwealth. As experts in the field, Vicinity would like to be a resource for this Task Force.

Vicinity is dedicated to a Clean Energy Future. With decades of experience tackling global energy problems on a local level while using local resources, Vicinity is committed to ensuring more efficient, reliable, and resilient generation of thermal energy for consumers across the Commonwealth, especially in its urban centers.

Thank you again for the opportunity to participate in the MassDEP initiative to develop a regulatory standard for reducing greenhouse gas emissions from fossil heating fuels. We welcome the opportunity to discuss these comments in greater detail with the Commissioner and staff.

Respectfully,

Matthew O'Malley
Chief Sustainability Officer

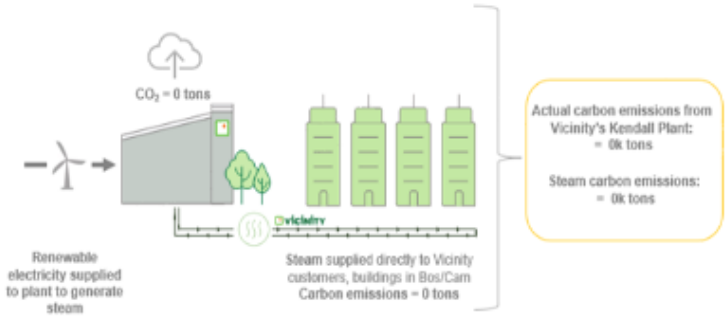
Vicinity Energy Inc.
vicinityenergy.us

Appendix A – Vicinity's Renewable eSteam™

Carbon Benefits of Vicinity's *Renewable* eSteam™ for Boston and Cambridge

Commercial buildings represent the highest source of carbon emissions in major cities, making them one of the most important targets in urban decarbonization.

To address this challenge, Vicinity now offers renewable steam to its customers in Boston and Cambridge. Instead of fossil fuels, Vicinity utilizes carbon-free electricity to generate eSteam™. Vicinity will procure electricity from renewable, carbon-neutral energy sources like wind and solar, and using state of the art technologies in our plant, will turn these electrons into steam. This means there will be **zero carbon emissions** associated with the eSteam™ we supply to our customers.



W.H. Riley & Son, Inc.

35 Chestnut Street - North Attleboro, MA 02760 - 508-699-4651

April 28, 2023

When my great-great-great-great-grandfather, William H. Riley, founded W.H. Riley & Son in 1873, he delivered the leading heating product of the day – coal– to families in North Attleboro using horse-drawn wagons.

Exactly 150 years later, our company now serves nearly 5,000 customers in more than 30 communities across southeastern Massachusetts, but we are still delivering the most advanced heating products of the day – biofuel and propane – to local families.

The Clean Heat Standard aims to eliminate fossil fuels for home heating purposes to attain net-zero carbon emissions by 2050. It's a laudable goal.

However, W.H. Riley & Son has strong objections to the CHS:

- The CHS would mandate that heating oil and propane retailers convert 3% of their customer base annually to electric heat pumps. Heat pumps are now fairly common as secondary sources of heat. However, they are extremely inefficient when compared to today's high-technology heating systems and simply inadequate when temperatures drop down into the single digits or below. In short, our customers will need to be prepared for cold nights in a home heated by electric pumps.
- The cost to install a heat pump is now over $20,000, roughly double the replacement cost of today's boilers and furnaces and out of the reach of most of our customers. A sizable public investment would be needed each year to assist 3% of our customers to convert to heat pumps.

W.H. Riley & Son and the entire heating industry in Massachusetts recognize the need to combat climate change. We are committed to being partners in legitimate, impactful climate change activities.

The heating oil industry has already reduced sulfur emissions from 3,000 parts per million to 15 parts per million, greatly reducing the leading source of acid rain. Under a program launched by the industry in cooperation with the state government, heating oil use in Massachusetts has been cut by 35 million gallons since January 2018.

To further demonstrate its willingness to address climate change, the heating oil industry has committed to reducing its greenhouse gas emissions, based on 1990 levels, by 15% by the end of this year, 40% by 2030, and net-zero by 2050. These goals can be met by using higher blends of Bioheat in heating oil.

W.H. Riley is joining many other Massachusetts heating fuel companies in providing higher blends of Bioheat to homes, a move that will reduce emissions at no extra cost to consumers.

The plan put forth by the Northeast heating industry will reduce Massachusetts' greenhouse gas emissions to net-zero in three decades – the same goal sought by our state leaders and by companies like ours.

And it will achieve that goal without burdening families financially or leaving their homes chilled when temperatures plummet.

Sincerely,
Jonathan Allen
Vice President
Phone: 508-699-4651
Email: jallen@whriley.com